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A NEW REGIONAL
GEOGRAPHY OF THE WORLD

A NEW REGIONAL GEOGRAPHY OF THE WORLD

BY
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AUTHOR OF "THE MEDITERRANEAN LANDS," "CANADA," ETC.

*WITH SKETCH-MAPS, DIAGRAMS, AND
ILLUSTRATIONS*



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INTRODUCTION

THE main object of geography may be said to be to bring out the relation between the life of organisms—of plants, animals and, particularly, of man—and the physical conditions which prevail on the surface of the globe. Those physical conditions vary notably from place to place, both in mass and in detail. Thus we have those fundamental climatic contrasts which result from the movements of the earth and its relation to the sun, and those great local differences in structure and relief which have their origin in its geological history. But we soon learn that the broad divisions based on climatic zones or outstanding relief features are of comparatively little help in giving us a picture of the earth's variety and complexity. In detail the difference between one mountain belt and another, between this and that area of tropical climate, and so forth, are very great.

Nor is this all: the organic responses to the physical conditions are also diverse, whether we consider plant or animal or man. Thus it is quite often stated that cactuses form the characteristic plants of desert areas, are part of the organic response to arid conditions. But with a single doubtful exception cactuses are limited to the American continent, and so far from being characteristic of deserts they are notable for their absence from the deserts of Africa, Asia and Australia, except where introduced by man. What is true is that desert plants show everywhere certain superficial resemblances to one another, the result of adaptation to similar conditions of life. Closer examination, however, shows that these resemblances mask real and profound differences.

Human societies show more than a little analogy. In an elementary survey it may be justifiable to speak of forest communities, tundra communities, and so on, as if an apparent similarity of physical conditions necessarily stamped the same imprint on the group; but more detailed knowledge renders such generalisations of little value. The resemblance in the physical conditions is often not so close as it appears; the human response is often highly complex.

Take a simple and familiar example. Parts of eastern England show, in the structure and relief of the lands, in the climate and vegetation, in certain aspects of the life of the inhabitants, much correspondence to areas on the mainland opposite. But while that correspondence would at once strike a stranger, to Englishmen it is far less obvious than the differences. These seem so overwhelming that the statement that the British Isles are but a separated fragment of continental Europe has for them an air of paradox. They feel instinctively that both their country and they, as its inhabitants, have an individuality, a differentness from other lands and other peoples which cannot be interpreted purely in terms of structure, relief, climate, drainage and so forth. That differentness comes, they know, from the fact that their forbears have lived long in these islands, that they inherit from them a tradition which seems to exert more influence than the purely physical elements of their surroundings. It is true that that tradition has its basis in physical features; but it is not always the obvious and outstanding features which exert most influence. For the physical geographer the shallow ditch of the North Sea is only a minor topographical accident; but it has had an enormous and cumulative effect on the peoples which it separates and yet links.

The difficulties facing a truly scientific treatment of geography thus appear very great. So varied is the surface of the globe that to acquire a detailed knowledge of the whole may seem a life's work, and yet such a

knowledge even if acquired would be but the beginning of geography. So varied and so complex are man's responses to these surface conditions, so much influenced by causes not in themselves directly and wholly geographical, that the broad and simple generalisations that served in the elementary stages seem a snare rather than a guide.

For such reasons some geographers maintain that more advanced work should be based on an intensive survey of particular parts of the surface, chosen so as to be as representative as possible. Such an intensive survey, it is said, makes it possible to bring out specific instances of man's response to his physical environment, with a certainty not otherwise obtainable. The alternative is regarded as being a world survey too superficial to be of any great value, supplemented by generalisations which more accurate and detailed knowledge might disprove.

There is much to be said in favour of such a limited, intensive survey; but it has great and obvious disadvantages. At the present time no part of the habitable world can be said to be completely isolated from the rest, and a limited and selective survey necessarily leaves out of account some of the factors which mould the lives of the inhabitants of the chosen areas. Great Britain is particularly notable for the multiplicity of its contacts with other lands, and the need for its inhabitants to fit themselves to discharge the elementary duties of citizenship demands a wide knowledge of the world. Is it possible, within reasonable limits, to take a world survey which shall combine a broad outlook with sufficient study of detail in regard to the more important areas to add interest and check hasty generalisation? This is the problem which this book attempts to solve, and some preliminary notes on aims and methods seem desirable.

The old division of the globe into continents does not correspond wholly with the outlook of the modern geographer. In particular, the division of the land-mass of the Old World into the three continents of Europe,

Asia and Africa has many disadvantages. It has been accepted here, however, with minor modifications in detail, for reasons of practical convenience.

Much more difficult is the question of the best way of subdividing the continents. The multiplicity of the political units in post-war Europe, no less than the vast size of some of the states of the New World, make some sub-division other than the purely political one a necessity if geography is to have any kind of rational basis. Here the conception of natural regions, founded by the late Dr. Herbertson and much elaborated since, is fundamental. The underlying idea is simple. On looking at any part of the earth's surface we perceive that, because of the great and sudden changes in structure and relief which occur from place to place, all the other phenomena which depend upon these basal facts, such as the particular type of climate, the characteristic plants and animals, and the life of man, change also, if less suddenly. A natural region, large or small, is thus an area with some unity of structure and relief, reflected in its climate and in the organic response to the sum total of the physical conditions. It displays in some or all of these respects a definite contrast to surrounding areas.

Because structure and relief form the basis of a division into such natural regions, these subjects are of prime importance. All reasoned geography indeed must take as its starting-point the build of the lands in the areas discussed. In this connection it is important to notice that while ordinary atlas maps usually show orographical colouring, that is give an indication of the heights of the lands above sea-level, it is at least rare to find among them plates representing even the essential structural features of the continents. Thus a small-scale orographical map of Europe will show, e.g., the central plateau of France in the same tints as parts of the Alpine chain, and affords no hint of those profound differences in structure and detailed relief between the two which are geographically so much

more important than the accident of similarity of height above sea-level. In such a preliminary survey of world geography as this the effects of the structure of the different lands on other geographical phenomena can be worked out in detail in certain cases only. Everywhere, however, great emphasis has been laid on these subjects, because in this way the key is given to the interpretation of atlas maps; the foundations are laid on which more detailed knowledge can be built as the need or the occasion arises.

For a somewhat similar reason the natural vegetation zones of the chief land-masses have been studied in some detail. The plant-cover of an area forms the best key to the sum-total of the climatic conditions, gives a much clearer picture than the plates showing isotherms reduced to sea-level, and mean annual rainfall, still so popular in atlases. Here again we have a basis for the interpretation of political maps, even although the actual significance of the natural plant-cover in relation to human life has been worked out in detail in this book only in the case of a few representative areas.

Two other points have to be noted. We have included as part of the concept of a natural region the notion that the modes of life practised by its occupants should show some characteristic features, no less than the plant-cover. But there is a very obvious difference between the adjustments to given conditions shown by the plants and the human communities. In the latter case not only is the adaptation conscious and deliberate, but the time element enters very largely. When a continent or a part of a continent has been inhabited by progressive and civilised peoples for a prolonged period of time, not only has adjustment between human societies and particular parts of the surface become peculiarly close, but the experience of the ages has, as it were, underlined the limits of the regions, so that these are at once apparent. From this again it follows that it is much easier to distinguish natural

regions in lands of old civilisation than of new. Further, in the old lands there is at least a tendency for political and administrative units to show some kind of relation to natural regions. The mathematically straight lines which often serve both as political and administrative frontiers in the new lands may be regarded from one point of view as an indication that natural regions in the complete sense do not as yet exist there. Nature has certainly drawn limits ; but civilised man is as yet but an intruder, too few in numbers, too recent an immigrant, to have been compelled to adjust himself accurately, to take full advantage of his opportunities. In such continents as South America and Australia in particular, where large tracts of virtually unsettled lands exist, a detailed division into natural regions seems unnecessary in an outline study such as this. It is sufficient to indicate the general characters of the continents, and to limit details to the crystallisation points, the areas within which developments are taking place.

In such cases a difference of treatment seems justified because one element of the complete natural region, the adapted human group, is absent. In parts of the old lands, particularly in north-central and eastern Europe, an analogous cause demands a corresponding change of outlook. Here the lands appear on the map monotonously dull and featureless ; nature seems to have set no obvious limits. But the historical movements of racial stocks, their impacts upon each other, their actions and reactions, show up, as it were, the minor details of topography, indicate where man has found limits to particular modes of life. In this case, then, historical facts have been freely introduced. Russia, in particular, may be said to illustrate the significance of the natural region negatively by showing how slow and difficult is the rise of a stable community where structure and relief are markedly uniform over wide areas, so that a human region has to be created where a natural region in the usual sense scarcely exists.

Generally it may be said that no rigid consistency of treatment throughout has been attempted. An effort has been made, within definite limits of space, to survey the world in such a fashion as to bring out the aims and methods of the modern geographer, to open windows rather than merely to present facts.

Facts there may seem to be, however, in superabundance. In particular it may be thought that too much emphasis has been laid on relief, and too little on attempts to interpret its significance. Both the emphasis and the omissions, where they occur, are deliberate. Not only is the varied relief of the earth's surface the geographer's starting-point, the fundamental fact, but a description of relief features is without value unless it is accompanied by close and careful map-study, and leads to an attempt to express the facts on a sketch-map. The detailed descriptions given are thus intended both to show what should be looked for on the map, and to drive home the lesson that familiarity with maps is the beginning and the end of geographical wisdom.

The apparent absence in much of the text of definitely formulated reasons for the distributions described may seem strange, in view both of their intrinsic interest and of the space they occupy in books of a more elementary nature. But the necessary material is there, though it has been left to the enthusiast to bring it together and thus taste the joys of independent discovery. Some hints as to lines of approach will be found in the supplementary chapter at the end of the book.

PART I
EUROPE AND ITS MARGINS

CHAPTER I

GENERAL SURVEY OF EUROPE

AREA AND RELATIONS. So far as size is concerned the continent of Europe is not comparable to either of its neighbours. It has an area of $3\frac{3}{4}$ million square miles, while Asia covers 17 million square miles, and Africa $11\frac{1}{4}$ million square miles. Further, while the Mediterranean Sea may seem to form a satisfactory separation from Africa, no single natural feature demarcates Europe from Asia. If we regard the Ural Mountains and the Caspian Sea as marking the natural limit of the European mainland, we have to notice that there is a wide gap between the two. The Balkan peninsula of Europe, again, is separated from the peninsula of Asia Minor only by the two drowned river valleys of the Bosphorus and Dardanelles, with the intervening Sea of Marmara. Here the distinction between the two continents means so little that Turkey has transferred its capital from one to the other without experiencing any difficulty in carrying on communication between the old centre and the new. Generally it may be said that on a globe or world-map Europe appears not as a separate continent, but merely as a narrowed, branched prolongation of western Asia.

Even the separation of Europe from the Atlas Lands of Africa is far less real than it appears at first sight. From the point of view of climate, of products, of ease of communication, indeed, the real Africa is separated from Europe not by the Mediterranean Sea but by the Sahara desert. The latter is a true zone of separation; but the unifying function of the Mediterranean Sea is so marked

that in considering the lands round its shores it is convenient to ignore the fact that these form parts of three continents, Europe, Asia and Africa, and to speak of them generally as the Mediterranean Lands. We recognise, that is to say, that within certain limits the areas included here show a definite resemblance to each other, and an equally definite difference from the adjacent parts of the continents in which they are included.

THE MARGINAL SEAS. Both the general narrowness of Europe, as compared with the great land-mass of Asia, and its complicated shape, with the numerous peninsulas and islands, are due to the great development of marginal seas. These form two series, a north-western and a southern.

The southern series is formed by the Mediterranean, with its branches, and the Black Sea. The latter is connected at its south-western corner with the *Ægean*, and thus with the Mediterranean Sea proper, and on the north with the Sea of Azov. The Caspian is a basin of internal drainage, totally cut off from the Black Sea and thus from the Mediterranean; but a depression lying north of the Caucasus Mountains suggests that at an earlier geological period it had an outlet to the Black Sea.

The north-western series of marginal seas begins with the North Sea, connected by comparatively narrow passages with the Baltic, which ends to the north in the Gulf of Bothnia and to the east in the Gulf of Finland. North-east of the Gulf of Finland, however, lie the large lakes Ladoga and Onega, and still further north the branched White Sea. Here again there is reason to think that at an earlier time the seas were more extensive, the two lakes being apparently the remnants of a former waterway from the Gulf of Finland to the White Sea.

The presence of these two series of seas, and, particularly, the south-west to north-east direction of the water-masses which extend nearly continuously from the Strait of Dover to the White Sea, produce a very striking con-

trast between eastern and western Europe. The former is massive, uniform, Asiatic. The latter has a comparatively narrow mainland section from which peninsulas jut out and islands are cut off, and is markedly diverse. In looking for a division line between the two we find that the first notable narrowing of the European mainland occurs between the Gulf of Danzig and the north-western corner of the Black Sea. If then we draw a line from the town of Königsberg to that of Odessa we have a boundary as satisfactory as any purely artificial line can be. It corresponds roughly to the eastern limit of the beech tree, which suggests that the climate is here undergoing a change. West of this line Europe is so interpenetrated by the bordering seas that no point is much more than 300 miles from sea-water; east of it points in the interior may be as much as 750 miles from the nearest sea.

But the contrasts go deeper than this. Though the marginal seas differ in character, and are not all of the same geological age, everywhere their presence speaks of earth movements, of a complicated geological history. Eastern Europe, for a prolonged period of geological time, has been stable, little affected by earth movements; in consequence it shows a relative simplicity of relief as contrasted with the variety characteristic of the western section.

STRUCTURE AND RELIEF OF THE LANDS (Fig. 1). Neglecting for the present certain features of the diagram, to which we shall return, we may note that in mainland Europe west of the Königsberg-Odessa line two great relief features occur—the young folded mountain chains, and the old, worn-down uplands (Plate I). The former constitute the Alpine Fold Mountains, and, if we leave the islands and peninsulas out of account, their course may be briefly stated. Beginning in the Pyrenees, they seem to be broken off short at the margin of the Mediterranean Sea but reappear, after the interruption, in the south-east of France. As the Central High Alps

they trend generally eastward through Switzerland into Austria. One branch, beyond the gap at Vienna, swings round in a great curve as the Carpathians, which are continued in the Transylvanian Alps. The other branch bends down the eastern shore of the Adriatic Sea to become, within the Balkan peninsula, the Dinaric Alps (Plate II), and this is regarded as the main chain.

The uplands lie in an interrupted belt north-west and north of the Alps. An isolated western section forms the low plateau of Brittany, but the most important part is a block of broken hill country which extends from the Ardennes and the Vosges through southern Germany to the Sudetes, which are separated by a narrow gap from the Carpathians. To this belt it is convenient to give the general name of the Central Uplands. It has a lower eastern continuation in the Polish plateau, of which the highest part is called the Lysa Gora.

The Central Uplands and the Alpine Fold Mountains form as it were the backbone of continental Europe. South and south-west of the high ground which stretches from the Ardennes to the curve of the Carpathians the surface is diverse, hills and plains alternating. North and north-east lies a continuous series of plains, widening eastwards into the great plain of Eastern Europe. Physically the plains are continuous from the Channel coast of France through Belgium and Holland into Germany and Poland and then into Russia, but, as we shall see later, it is possible to divide them on the basis of soils and underlying rock structure.

So far we have neglected the peninsulas and islands which form so striking a feature of Europe west of the Königsberg-Odessa line. That these are but parts of the mainland, cut off more or less completely by the sinking of the marginal seas, is shown by the way in which the physical features of the mainland re-appear in them. Thus the Alpine Fold Mountains re-appear in Spain (e.g., in the Sierra Nevada), in the Italian peninsula



FIG. 1.—THE STRUCTURAL ELEMENTS OF EUROPE.

1. The Baltic Shield. The similar area in the north-west of Scotland resembles the Canadian Shield (Fig. 35) of North America.
2. The ancient (early Palaeozoic) Caledonian zone of folding, A¹ its N.W. limit or front; A² its S.E. front.
3. The Armorican or Hercynian zone of folding (late Palaeozoic), B its N. front. The uplands within this belt are lettered (a) S.W. Ireland, (b) S.W. England and Wales, forming the continuations of (c) the Armorican plateau of Brittany, (d) the Spanish plateau, or meseta, (e) the Central Plateau of France, (f) the Ardennes continued into the Rhenish Uplands, (g) the Vosges and Black Forest, (h) the Odenwald and Spessart. (i) the Bavarian and Bohemian Uplands, ending eastwards in the Sudetes.
4. The Alpine zone, showing recent (Tertiary) folding.

(Apennines), in Greece, and in the islands, as in Sicily and Crete. The Central Uplands are represented in the British Isles, as in Cornwall and Devon. The plains extend westward into eastern England and northwards into the Danish peninsula and islands, as well as into southern Sweden.

THE FOUR MAJOR NATURAL REGIONS. The relief and the distribution of land and water give Europe a variety of climates which is very striking in view of the small total area. Necessarily this is more marked to the west than to the east of the Königsberg-Odessa line, since Eastern Europe is characterised by its generally uniform surface and its remoteness from sea influences. Further, in the complex west it is at least relatively easy to find dividing lines between the areas of different climatic type, even if transitional zones exist, while in the east no outstanding relief features break the surface uniformity.

Climate influences man's life in many ways, particularly by determining the uses which can be made of the lands. When to a particular type of climate are added specific relief features, and characteristic relations to surrounding lands and to the sea, we have, as has been already explained, what is called a Natural Region, a well-defined area within which particular modes of life can be practised, differing in certain ways from those characteristic of adjacent areas. Europe can be divided into four Major Natural Regions, within which the political units may be grouped.

These four are :—(1) the Western or Oceanic ; (2) the Mediterranean, which includes certain parts of Asia and Africa ; (3) the Central ; (4) the Eastern.

(1) The Western or Oceanic Region includes the lands lying north and west of the Alpine Fold Mountains, and west of the main mass of the Central Uplands. The surface is varied, plains when present being comparatively small. An outstanding feature is the free exposure to



HIGHLAND SCOTLAND—LOOKING TOWARDS THE CAIRNGORMS FROM
ROTHIEMURCHUS FOREST

The flat tops of the hills are due to the way in which they have been carved out of the plateau to which the ancient Caledonian mountains were long since reduced. The forest is the impoverished equivalent of the coniferous belt in continental Europe. *Photo by Rev. A. E. Robertson.*



SUMMIT OF GREAT ST. BERNARD PASS (p. 110); HEIGHT OVER 8,000 FT.
VIEW TAKEN AT THE END OF JULY

The scenery is characteristically alpine, the sharpness of the peaks and ridges contrasting with the rounded contours of the Scottish Highlands. *Photo by W. Parsons.*

the ocean, which affects the climate profoundly, and has also influenced the life of the people.

(2) The Mediterranean Region owes its existence to the Alpine chains, which tend to form a climatic divide, and to the presence of the Mediterranean Sea. The climate shows certain resemblances to that of Oceanic Europe, with marked peculiarities of its own. The relief is mainly mountainous, and where fairly extensive plains exist, as in North Italy, the characteristic climate is modified. Broadly, the true Mediterranean Lands are those areas cut off by mountain chains from the adjacent continents.

Much more complicated are the conditions in (3), the Central Region, which is less of a unit than either the Western or the Mediterranean. It lies north and north-east of the main Alpine Chain and west of the Königsberg-Odessa line. The relief is very diverse. The region includes wide plains to the north; it is crossed by the belt of the Central Uplands; it is penetrated not only by the Carpathians and their continuation in the Balkan Mountains, but also by parts of the High Alps. Outlets to the open ocean are few. The climate shows an approach to the Eastern type, but is without the "Asiatic" extremes of the latter.

(4) The Eastern Region may be briefly dismissed. It consists almost wholly of plain country; the climate, from the European standpoint, is extreme; access to open water is difficult.

CLIMATES OF THE MAJOR NATURAL REGIONS. Since the Major Natural Regions are characterised particularly by the differences in their climates, it is necessary to consider these in some detail. One or two general points must first be noted.

The significance of climate to the geographer is due to the way in which it affects man's whole life, and particularly his crop-plants. As regards temperature, freezing point (32° F.) is important, because when any month has an

average temperature below freezing, any precipitation will fall as snow, inland waterways will freeze, and work on the land is completely stopped. It is more difficult to fix a temperature limit for plant growth. But it seems probable that in latitudes such as those of Europe most common plants do not begin to grow till the average temperature rises in spring to at least 43° , and cease growing when it drops below this in autumn. This means that when at any station (see Fig. 2) no month has a mean temperature below 43° , some growth, as of grass and hardy crops, will occur throughout the winter. But when, as at Moscow (Fig. 3), only five months have an average temperature of over 43° the farmer is limited to crops, such as the cereals and root crops, which can run through their life-history very quickly. When we speak of regions of mild or severe winters it is well to think in terms of agriculture, and the two limits of 32° and 43° serve as good indices.

We should think of rainfall in the same way, but here it is very difficult to give figures, for the amount of rain plants require depends very greatly on temperature conditions. Generally speaking, however, plants require most moisture when they are growing fast, and less when they are ripening seed. Trees can take water from the deeper layers of the soil, but most herbaceous plants are dependent on showers moistening the upper layers. Therefore whether, from the farmer's standpoint, a station may be described as dry or wet depends not only upon the total rainfall but also on the season of fall, and the temperature. Paris (Fig. 2) receives less rain than Naples (33 in.), but Paris has a sufficient and Naples an insufficient rainfall, not only because of the differences in the summer temperatures, but because much of the rain at Paris comes in summer when it is most needed, while Naples has little rain during the hotter season. Such facts make the distribution of rain throughout the year a subject of great importance.

The general features of the climate of *Western Europe*

can be briefly summarised. The winters are mild; except in northern Norway, or at great heights, the mean temperature of the coldest month never falls to freezing point. The summers are cool and cloudy. The rainfall is everywhere sufficient for agriculture, and is excessive

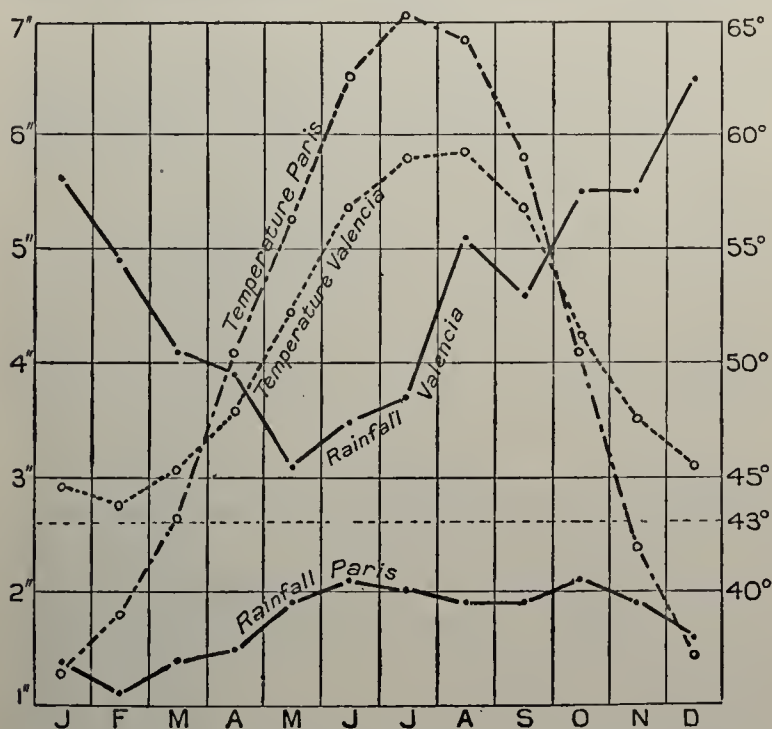


FIG. 2.—MEAN TEMPERATURE AND RAINFALL AT VALENCIA AND PARIS.

in places exposed to ocean winds and in elevated areas. It is well distributed throughout the year, with a tendency to a spring minimum and an autumn maximum.

A study of Tables I and II and of Fig. 2 brings out a number of details. A comparison of Valencia and Bordeaux shows that mean winter temperatures depend not upon latitude but upon degree of exposure to ocean influences. But Table I shows clearly that summer

temperatures do depend upon latitude. It brings out also that the warming effect of ocean winds in winter is more marked than their cooling effect in summer. Thus

TABLE I
RAINFALL AND TEMPERATURE RANGE OF STATIONS IN WESTERN EUROPE.

Station.	Latitude.	Height in feet above sea level.	Mean temperatures. °F.		Total rainfall (inches).
			Hottest month.	Coldest month.	
Bergen ..	60½°	66	July 57·9	Feb. 33·6 (Jan. 34·2)	73·1
Valencia ..	52°	30	Aug. 59·3 (July 59)	Feb. 43·8 (Jan. 44·6)	56·0
London ..	51½°	111	July 62·8	Jan. 38·7	25·1
Paris ..	49°	184	July 65·5	Jan. 36·5	20·8
Bordeaux ..	45°	33	July 68·2	Jan. 40·6	33·4

TABLE II
DISTRIBUTION OF RAINFALL THROUGHOUT YEAR IN WESTERN EUROPE.

Station.	% of total in months October to March.	% in spring (March to May).	% in summer (June to August).	% in autumn (September to November).	% in winter (December to February).
Bergen ..	56%	17%	22%	33%	28%
Valencia	58%	20%	22%	27%	31%
London ..	49%	21%	29%	28%	22%
Paris ..	46%	23%	28%	29%	20%

there is more difference between the January temperatures of Valencia and London than there is between their July temperatures. It may be added that Brest, which is but half a degree of latitude south of Paris, is 6° warmer in

January, but has almost the same July temperature. This means that places on the coast have a smaller temperature range than those in the interior. Another point of interest is that the drop of temperature to its lowest point in winter is delayed on the coast as compared with

TABLE III

RAINFALL AND TEMPERATURE RANGE OF VIENNA (lat. 48°, height above sea-level 663 ft.) AND OF KIEV (lat. 50½°, height 590 ft.) AS REPRESENTATIVE STATIONS IN CENTRAL AND EASTERN EUROPE.

Station.	Mean temperatures.		No. of months below mean of 32°.	No. of months below mean of 43°.	Mean Annual rainfall (inches).
	Hottest month (July).	Coldest month (January).			
Vienna ..	67·3	28·9	2	5	24·6
Kiev ..	66·6	20·8	4	5	21·0

TABLE IV

DISTRIBUTION OF RAINFALL THROUGHOUT YEAR AT VIENNA AND KIEV.

Station.	% total fall October to March.	% in spring.	% in summer.	% in autumn.	% in winter.
Vienna ..	39	27	34	21	18
Kiev ..	39	23	37	23	17

places in the interior. Thus February and not January is the coldest month at Bergen and Valencia. Valencia shows that there is a slight tendency to a similar lag in summer, August and not July being the warmest month there.

Table II merits careful study in connection with the distribution of rainfall. It shows that it is only in places on the oceanic margin that the tendency to a spring

minimum and an autumn and winter maximum is well marked. At Paris and London more than one quarter of the total falls in the summer months. This is an indication of an approach to "continental" conditions, summer rainfall being characteristic of the interior of the continent.

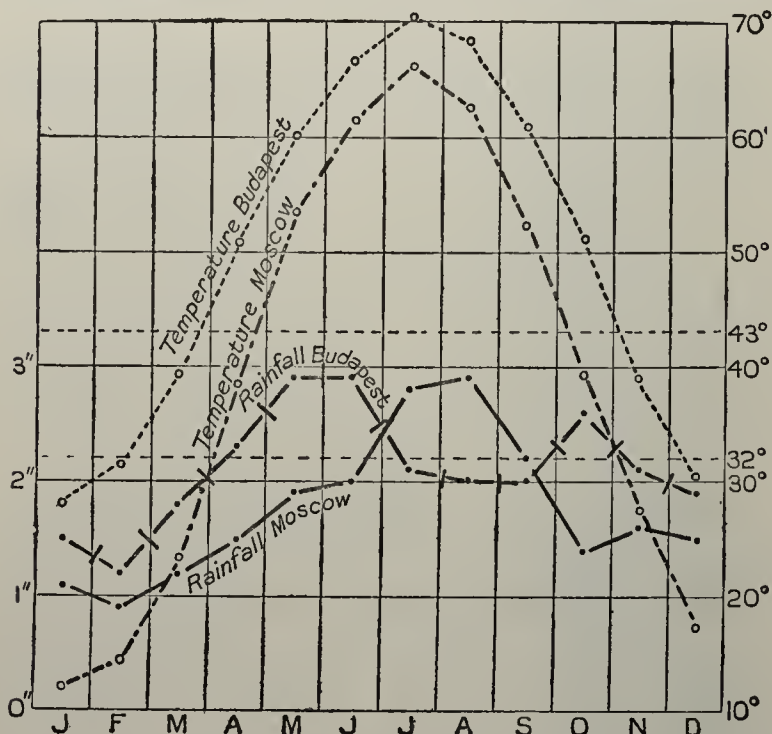


FIG. 3.—MEAN TEMPERATURE AND RAINFALL AT MOSCOW AND BUDAPEST.

In *Central Europe* the winters are cold, one month at least having usually a temperature below freezing point. The rainfall is moderate and distributed through the year, but the maximum tends to occur in summer.

The conditions at Vienna (Tables III and IV) and at Budapest (Fig. 3) show that the colder winters in this Region are not counterbalanced by an equivalent rise in the summer temperatures. On the other hand, the

fact that summer is quite definitely the wettest season is important, as is also the fact that the total rainfall is generally sufficient for plant growth.

Eastern Europe differs in the greater severity of the winters; as a rule several months have a temperature

TABLE V
RAINFALL AND TEMPERATURE RANGES AT STATIONS IN THE
MEDITERRANEAN REGION.

Station.	Latitude.	Height above sea- level (feet).	Mean temperatures.		Mean annual rainfall (inches).
			Hottest month.	Coldest month.	
Seville ..	37½°	66	Aug. 84·9	Jan. 52·2	18·6
Palermo ..	38°	230	Aug. 76·6	Jan. 50·5	29·8

TABLE VI
MEAN SEASONAL RAINFALL (inches).

Station.			Spring.	Summer.	Autumn.	Winter.
Seville ..	..	..	6·1	0·8	5·0	6·7
Palermo ..	..	..	7·1	1·5	9·5	11·7

(Calculate percentage falls in each season, as is done in Tables II and IV.)

below, often much below, freezing point. The rainfall is moderate or deficient and the maximum occurs in summer.

In the *Mediterranean Region* the winters are mild and moist, recalling those of Western Europe. The summer rainfall is always scanty and one or more months may be entirely rainless. The skies are so clear that there is much more sunshine in winter than in Western Europe, the

winter rains tending to occur in short heavy showers. The total rainfall is often deficient, and irrigation is frequently practised. The actual rainfall depends on the position of any particular station (Fig. 4); but the marked periodicity is characteristic, more than one-third of the total usually falling in the three winter months, and less than one-tenth in the three summer months.

NATURAL REGIONS AND POLITICAL UNITS. Associated with the diversity of climate and relief in Europe we find a multiplicity of states, this being particularly marked to the west of the Königsberg-Odessa line. Though it is true that some of these states, as, for example, France, transgress the limits of a single region, there is much convenience in grouping them on a regional basis. Such an arrangement gives us a general idea of the climate, relief and relations of each unit, and of the modes of life likely to be practised by its inhabitants.

Within the Western Natural Region we may group France, the British Isles and Norway. In all cases some part at least of the state territory has the typical oceanic climate; the surface shows a characteristic combination of plains, usually small, and uplands; the marginal position has given the inhabitants a world outlook which, in the case of the two greater powers, expresses itself in the fact that the national territories extend overseas.

The Central Region, in harmony with its structural complexity, includes a greater number and variety of political units. As common characters these have the greater severity of their winter climate with the tendency towards a definite summer maximum of rainfall; a difficulty of access to open water, which increases eastwards as the continent widens, and renders the outlook of the different states increasingly continental rather than oceanic; a tendency for the relief features, whether plain, uplands or fold-mountains, to show great longitudinal extension, so that natural state boundaries are difficult to find.

NATURAL REGIONS AND POLITICAL UNITS 17

Three sub-divisions can be recognised. In the Northern Section the presence of the North German Plain—using the term in the large sense—is the dominant feature. Here we may include Germany, Poland, Sweden, Denmark, Belgium and Holland. The two last have many features in common with the states of the Western Region, but

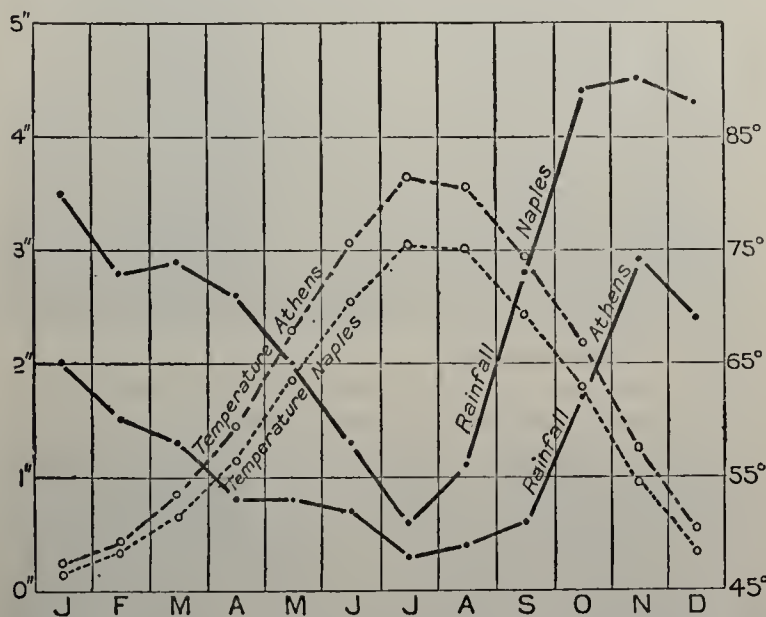


FIG. 4.—MEAN TEMPERATURE AND RAINFALL AT ATHENS AND NAPLES.

their climate tends to approximate to the Central type, and the fact that Holland is wholly, and Belgium mainly, plain country makes it better to include them in the Central Region. Only a small part of Sweden is lowland, but that part includes the centre of gravity of the country. The relative difficulty of access to open water also, no less than the severer climate, makes the contrast between Sweden and Norway so great that they are better placed in separate regions.

The second section may be called the Alpine-Carpathian. Here are included Czechoslovakia, Austria, Switzerland, Hungary and Roumania. Of these states Hungary is purely plain, and Roumania has considerable plain areas, but the other three have large tracts showing high relief.

In the Balkan section we may include Yugoslavia, Albania and Bulgaria, mainly in order to emphasise the fact that the Balkan peninsula has a much more intimate connection with the European mainland than either the Iberian or Italian ones. Though both Yugoslavia and Albania have an Adriatic sea-board and Bulgaria a Black Sea one, all three states show the Central European feature of poor sea-outlets. Save over small areas all three display the Central European type of climate. In relief they recall the Alpine-Carpathian states, but differ markedly from these as regards their cultural development.

The great feature of the Eastern Natural Region is that the surface is almost uniformly level, from the Arctic Ocean to the Caspian, and from the Baltic, with its gulfs of Riga and Finland, to the Black Sea. Associated with this monotony of relief we find that prior to the post-war period one great state, the Russian Empire, stretched from sea to sea. The states now included are Soviet Russia, Finland, Lithuania, Latvia and Estonia. Everywhere the winters are very severe and access to open water is difficult; the outlook of Russia is Asiatic rather than European.

The Mediterranean Region includes Italy, Spain, Portugal, Greece and Turkey, and to these states we must add the Atlas Lands of North Africa, Syria and Palestine, which are continuations of the European Mediterranean Lands. Turkey is now mainly limited to Asia Minor and is only to a small extent a European state. The states of the Mediterranean Natural Region centre about latitude 40°, and latitude is one of the factors influencing the



THE KARST OR LIMESTONE COUNTRY OF THE
DINARIC ALPS IN HERCEGOVINA

This type of scenery is present throughout the west of the Balkan Peninsula. Cultivation is limited to occasional basins in which soil accumulates, and most of the land yields but scanty pasturage.



OLD HARBOUR OF RAGUSA (DUBROVNIK), DALMATIA,
NOW INCLUDED IN YUGOSLAVIA

A narrow belt of fertile land, yielding typical Mediterranean crops, fringes the coast, while behind rise the barren karstic hills.

characteristic climate. Extensive plains are absent, and the Mediterranean Lands proper are traversed by continuations of the Alpine Fold Mountains.

A full description of the climates of Europe, as of the other continents, with many statistics, is to be found in *The Climates of the Continents*, by W. G. Kendrew (Oxford, 1922). For the geography of Europe, see Lyde, *The Continent of Europe* (London, second edition, 1924), which discusses the new, post-war states; and Hettner, *Grundzüge der Länderkunde*, I, *Europa* (Berlin, third edition, 1925). For Western Europe, see Newbiggin, *Frequented Ways* (London, 1922).

CHAPTER II

WESTERN EUROPE : FRANCE

STRUCTURE AND RELIEF. In the heart of France lies the Central Plateau (Fig. 5), an upland region varying from 1,500 feet in height in the north-west to over 5,000 feet in the south-east. It is composed mainly of very old rocks like schists and gneiss, but volcanic eruptions took place in geologically recent times, giving rise to the remarkable scenery of the Auvergne. To the east and south-east the Plateau ends abruptly, the high and steep south-eastern edge forming the Cevennes. In the north-east, north-west and south-west, however, it thrusts out prolongations towards the lower ground.

The north-eastern prolongation is the Morvan, a wooded upland which approaches but does not reach the Vosges. Eastward the Vosges are separated from the hills of the Black Forest by the Rhine Rift valley, the sinking of this having separated the two groups, which were originally continuous. To the north-west the Lorraine plateau links the Vosges to the Ardennes, of which only a small part lies within France. To the west of the Vosges-Lorraine area lies a great area of low ground to which, by extension, we may give the name of the Basin of Paris.

The north-western extension of the Central Plateau, which is much less marked than the other two, forms the Limousin Plateau. It approaches but does not reach another area of old rocks, the Armorican Plateau. Armorica ("before the sea") was the name given to the country inhabited by the Celtic Armorici, who in Cæsar's time dwelt between the Seine and the Loire, and later were

confined to Brittany. The Armorican Plateau covers a larger area than Brittany, for it extends northwards into the peninsula of Cotentin and southwards to the Vendée, that is across the Loire. Like the Ardennes-Vosges area it is a remnant of an old worn-down mountain chain.

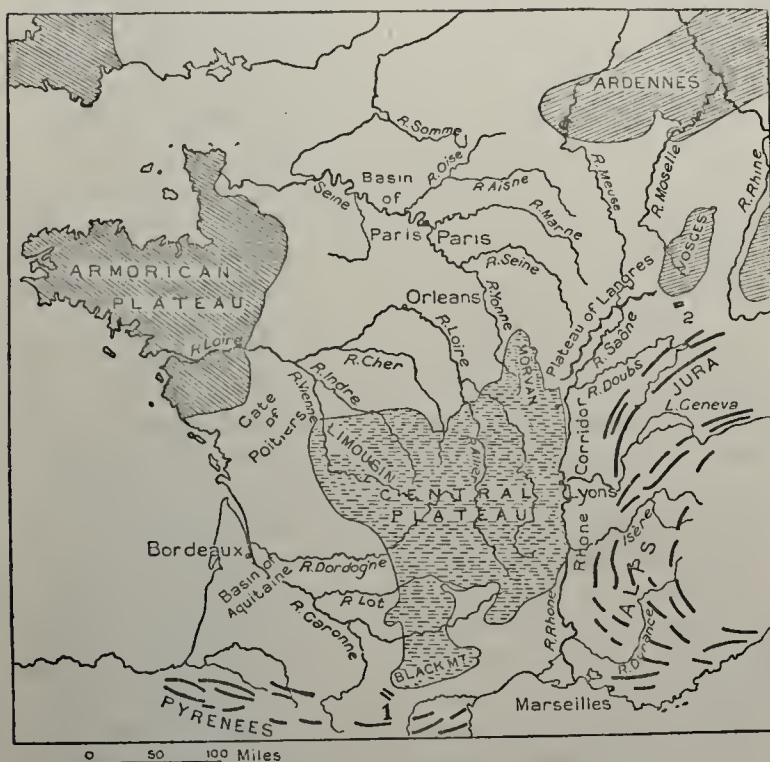


FIG. 5.—STRUCTURAL ELEMENTS OF FRANCE.

1. The Gate of Carcassonne ; 2. The Gate of Burgundy.

Between the two there once extended a wide sea-gulf, and it is this, filled in by younger beds, which forms the Paris Basin.

To the south-west the Central Plateau pushes out a tongue-like prolongation in the Black Mountain (Montagne Noire), which advances towards the Pyrenees. Between the Central Plateau to the east, the Armorican Plateau

to the north, and the Pyrenees to the south once lay a second sea-gulf, which has been also filled in by young rocks and has given rise to the Basin of Aquitaine. Finally, between the Jura Mountains and the Alps, which together form a large part of the eastern boundary of France, and the Central Plateau lies a trough or corridor, occupied first by the Saône and then by the united Saône and Rhone. Like the two Basins this furrow is floored by soft Tertiary beds with harder limestones and other Secondary rocks on their margins. It varies greatly in width, for while its upper section (Burgundy) and its lower section (part of Provence and of Languedoc) show fairly wide plains, portions of the intervening sections are narrow and gorge-like. With the corridor we may conveniently include the remainder of Provence and Languedoc, old provinces which extended respectively east and west of the Lower Rhone valley.

As the name corridor suggests, the Rhone-Saône valley forms a passage-way from the shores of the Mediterranean towards the north. At first sight this passage-way seems to end blindly in the Upper Saône area; for a sill, or hill-belt, connects the Morvan to the Vosges, and a similar if narrower sill links the Jura to the Vosges. The first sill consists of the Côte d'Or ("Golden Slope") behind Dijon, then of the Plateau of Langres and finally of the Faucilles Hills. All, however, are so dissected by river valleys as to offer no real obstacle to the construction of roads and railways, so that the corridor is in easy communication with the Basin of Paris. The River Doubs, again, a tributary of the Saône with a very curious course, has etched out a passage through the Jura, and a gap, the Gate of Burgundy or Gap of Belfort, leads from the Saône valley to the Rhine Rift valley, part of which has recently again become French (lowland of Alsace).

More obvious gaps connect the plains of Languedoc, and thus the Mediterranean shores of France, with the Basin of Aquitaine, and that Basin again with the Paris Basin.

The first gap is the Gate of Carcassonne, which leads from Narbonne on the Mediterranean to Toulouse on the River Garonne ; the second, the Gate of Poitiers, affords easy communication between Aquitaine and the Paris Basin.

UNITY OF THE NATURAL REGIONS. It is thus clear that France can be divided into three mainly lowland and four mainly upland regions. The first consist of the Basin of Paris, the Rhone-Saône corridor, with the Mediterranean seaboard, and the Basin of Aquitaine. The upland areas are the Central Plateau, the Armorican Plateau, the Ardennes-Vosges Plateau, with the plateau of Lorraine and the lowland of Alsace, and the French Alps with a part of the Jura Mountains, which also extend into Switzerland. Before we examine these regions it is well to try to realise how beautifully France illustrates the unity of diverse elements. (Though it shows a combination of upland and lowland, yet the productive plains are so linked together in the interior, and have so wide a sea frontage, that there is little real isolation of any part of the country.) At first sight it might seem that the differences of climate and thus of products would tend to separate the regions. The Western European climate occurs in its extreme form only in the peninsula of Brittany ; the typical Mediterranean climate is found on the Mediterranean coast, particularly round Nice in the Riviera ; Paris, and more definitely Lyon, show the tendency of inland places to approach Central European conditions. Lyon has a slightly colder winter than Paris (p. 11), a considerably warmer summer, a heavier total rainfall, and a greater proportion of the total fall in the summer months. Associated with such climatic diversities is an apparent marked difference in products. Sugar beet is almost confined to the north-west part of the Basin of Paris, particularly the plain of Picardy ; the mulberry for feeding silkworms occurs in the lower part of the Rhone valley ; maize is grown in Burgundy and

in the Basin of Aquitaine, both regions where it receives the necessary combination of summer heat and moisture; the delicate olive tree is grown only in sheltered parts of Mediterranean France, shrinking back from the blasts of the cold winds of winter and spring on the coast between Marseille and Narbonne, and seeking shelter at the base of the hills further inland.

But when we look a little closer we find that quite often what seem to be great contrasts in climate and relief cancel out in practice and do not lead to a similar contrast in products and occupations. Maize is typically a product of that part of a continental interior where the summers are at once fairly hot and fairly wet; the fact that it grows in France both in Burgundy and Aquitaine reminds us that from the farmer's standpoint the difference between the modified Western climate and the modified "continental" type matters little, for the summer conditions are similar though the climatic type is different. Wheat came to continental Europe from the south-east and is not generally suited for the climate of the north-west. But in France wheat is cultivated almost everywhere in the lowlands, and is largely produced in the north-western section, as in Picardy, as well as in the plains of Beauce and Brie, respectively south and east of Paris. We think of wine as a typical Mediterranean product; but France is the greatest wine-producing country in the world, and the vine is grown for wine-making as far north as a line starting from the lower Loire valley, and running in a north-easterly direction to pass to the north of Reims and the north-west of the River Moselle.

A country which produces much wine and wheat does not seem at first sight likely to carry many stock animals, or yield much dairy produce. But Brittany, Normandy, parts of the Central Plateau, the Morvan and parts of the French Alps carry many cattle, and the less rich pastures feed sheep. Local diversities which attach the people

strongly to their own regions, their "pays"; basal resemblances which cause them to feel that the motherland, the "patrie," is a unit, not a collection of parts: these have made the Frenchman what he is, have given him his characteristic reluctance to leave a land which to his mind yields all that the heart of man can desire.

Again, if we look at France in its relations to other countries, it is clear that, forming as it does the end of the Central European "peninsula," it is naturally traversed by important international routes. Its ports serve three seas, the North Sea through the Channel ports, the Atlantic and the Mediterranean; but the fact that Marseille is much the largest port reminds us that, despite the shortness of the Mediterranean coast, the connections of the country are mainly with the Mediterranean Lands and the areas beyond. Since Roman and even pre-Roman times, indeed, France has played the part of intermediary between Continental Europe and the Mediterranean world. More than Greece, or Italy, or Spain, all of which have had troubled histories, it has been the heir of the classical tradition. The fact that it leads not Europe only but the civilised world in what we call fashion, that is the application of the arts to daily life, is but one indication of the way in which it has cherished its long heritage, and been able to radiate influences by means of its great highways.

Of the six railway systems the most important is the Paris-Lyon-Mediterranean (P.L.M.), which connects Paris to Marseille, and also to the French Mediterranean coast from the Italian frontier east of Nice to the port of Cette, and sends out branches to Switzerland and Italy. The main route (Fig. 6) ascends first the Seine and then the Yonne valleys from Paris, tunnels through the Côte d'Or, and so reaches Dijon in Burgundy on the western margin of the Saône-Rhone corridor. Here it turns south past Macon and Lyon to Marseille. From Macon a branch runs past Bourg to Culoz, where one line turns north to

Geneva, and another passes Chambéry to penetrate the Alps by the Mont Cenis tunnel, the oldest of the great Alpine tunnels, and so reaches Turin. From Dijon another route goes by Dôle and Frasné to Lausanne, and thus connects with the Simplon route to Milan.

From Paris the Eastern railway system gives access to the third of the great Alpine tunnels, the St. Gothard, by a route which follows the Seine valley past Troyes, crosses the plateau of Langres and passes through the Gate of Burgundy at Belfort to reach Basel. Perhaps more important is the route which, starting from Paris, attains Nancy by way of the Marne valley, crosses the Vosges by the Saverne gap, and so comes down to the Rhine valley at Strasbourg, whence Basel is reached, past which the route runs eastward to the Danube and Vienna and southward to the St. Gothard and Milan.

Connections with Spain are obtained by the Orleans and Southern (Midi) routes, either by Orleans, Tours, Poitiers and Bordeaux to Madrid *via* the western end of the Pyrenees and Bayonne, or from Orleans by Toulouse and Narbonne to Barcelona *via* their eastern end. The new Somport tunnel gives a shorter route from France to the Ebro valley than the older Bayonne-St. Sebastian route, for it penetrates the barrier of the Pyrenees, giving direct access from Oloron on the French side to Canfranc on the Spanish, which is again connected to Jaca and so to Saragossa. The Northern system connects Paris to Belgium, and the State lines that city with Channel ports.

For internal traffic and to some extent for international traffic, particularly in the north and east, the railways of France are supplemented by the inland waterways. Most of the larger rivers are navigable, though it should be noted that the Rhone is too swift even for much goods traffic, usually only carried on in the downward direction. The more important rivers are linked to each other by canals, which are particularly numerous in the north-east part of the country.

THE NATURAL REGIONS. 1. *The Paris Basin.* This is drained mainly by the Seine, whose tributaries, rising

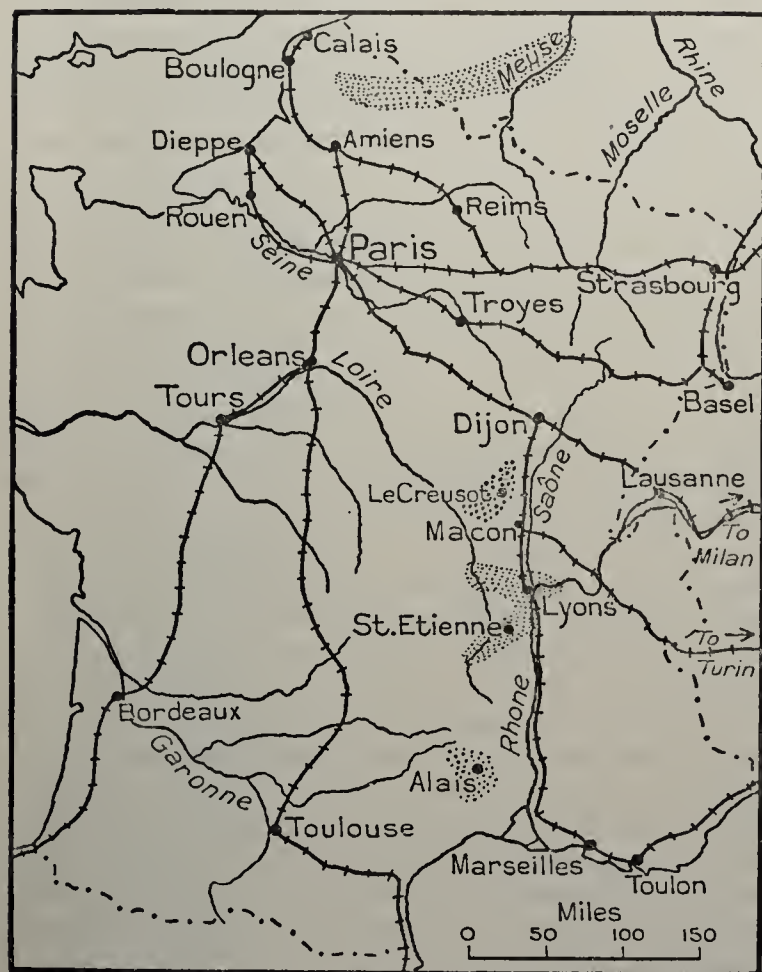


FIG. 6.—THE MAIN RAILWAY SYSTEM AND COALFIELDS OF FRANCE.

The chief coalfields are indicated by stippling.

on the south and east of its hilly rim, converge towards Paris in a fashion which explains the importance of that town. All lines of communication in France, rail, road

and waterway, centre on Paris, but it is noteworthy that Reims, the ecclesiastical centre, was the point of convergence of the Roman road system. In addition to the Seine, part of the Loire is also included in the Paris Basin as we have defined it. The marked bend northward of this river, with Orleans at the apex of the bend, should be noted. The only other important river is the Somme, with the cathedral town of Amiens on its course.

The Basin is generally very fertile, and produces wheat (p. 24); wine, particularly in the Loire valley round Tours (Touraine) and in Champagne round Reims and Epernay; sugar beet; tobacco; hops; market garden produce and fruit; but flax is no longer an important crop. The chalk of "dry" Champagne, the clay soils of Sologne within the Loire bend, as well as other upland or less fertile areas within the Basin carry sheep, and the area has always been notable for its production of industrial raw material, now supplemented by overseas supplies, particularly of cotton. The most important coalfield of France, a continuation of that of Belgium, lies in the north-west, and coal is mined at Béthune, Lens and Anzin. Raw material, particularly wool, and water power explain the early development of textile manufactures here, and with the use of coal and machinery these manufactures have become important. Lille manufactures woollen, cotton and linen goods. Amiens, Rouen and Reims are other woollen towns, Rouen also producing cotton goods, while Cambrai and St. Quentin are linen towns. Many minor manufactures are also carried on, those of Paris in particular being remarkable for their artistic finish and the amount of skilled labour required.

2. *The Rhone-Saône Corridor and Mediterranean Seaboard.* Here the special features are:—the warm summer climate, due to the inland position in Burgundy and the latitude in the south, and the consequent production of crops requiring a good deal of heat; the

easy communications, carried on, however, mainly by rail rather than by waterways; the presence of small coalfields and the way in which coal can be supplemented by hydro-electric power ("white coal"), obtained from the streams which flow down the steep margins of the corridor, those on the Alpine side being particularly important. As compared with the Paris Basin, where wine production is localised, almost all parts of this warmer region yield wine. Much of this, however, is of comparatively small value, and is consumed by the local rather than by the world market. The wines of Burgundy form an exception, being generally more valuable than those of the more southerly regions. The fact is interesting, because it is common to find that where a plant is grown near its climatic limit, and thus demands care and skill, the product is better than where conditions are so favourable that a crop can be obtained even by careless cultivation. In this particular case, however, another cause is the fact that wine matures best in an area with a cool or cold winter.

In addition to the widely distributed vine and to wheat, the region yields certain special products, notably silk, dependent upon the mulberry, grown particularly in the lower Rhone valley; olive oil; early flowers; the more costly vegetables; perfumes and essences from the flowers and fruits of Provence. All these are of high value in relation to their bulk, and thus the fact that they must be carried by rail is of less importance; they are, indeed, mainly luxury goods. Where power or fuel is required for the working up of raw material, as in the manufacture of silk, the amount is relatively small in relation to the value of the final product, which makes the limited supplies of coal no great disadvantage. The coalfields (Fig. 6) lie on the edge of the Central Plateau, the chief being Le Creusot, south-west of Dijon; St. Etienne, south-west of Lyon; and Alais, north-west of Avignon. Iron industries are carried on on all three, particularly

machinery and rolling stock at Le Creusot, and guns and munitions at St. Etienne. Silk goods are manufactured at Lyon and also at Avignon and Nîmes, and ribbons at St. Etienne. The access to additional supplies of raw silk from Italy by the Mont Cenis route, and from the Far East by Marseille, is important.

Marseille refines oil and manufactures soap, local supplies of olive oil being supplemented by imports, especially from Tunisia, while other oils are obtained from West Africa. Its position on a rocky coast well to the east of the marshy Rhone delta should be noted. It is somewhat exposed to the mistral, the strong, cold master ("magistral") wind of the lower Rhone valley. Complete shelter from this wind is only obtained further east in the Riviera, where the hills rise close behind the coast; thus the delicate citrus fruits (oranges and lemons) have a very limited extension in France. Grasse, behind the winter resort of Cannes, is the centre of the manufacture of essences and perfumes. The towns to the west of the Rhone delta, such as Montpellier, have rather cold, windy winters, and from Marseille westwards the coast-line is low, with many salt lagoons. The presence of salt-pans here (as also on the lagoon coast of the Bay of Biscay) should be noted; for the manufacture of salt from sea-water in such pans is common on shores where the summer climate is warm and fairly dry, and is carried on in many parts of the Mediterranean shores, e.g. in Sicily, Tunis, etc.

3. *The Basin of Aquitaine.* Here the vine is extensively cultivated, especially in the Garonne valley, and the wines find an outlet in the port of Bordeaux. Cognac, on the Charente, gives its name to a particular kind of brandy. Wheat, maize, tobacco, fruits, etc., are all grown, but not olives, mulberry trees nor citrus fruits. South of the Gironde estuary there is a barren, ill-drained coastal strip, where sand-dunes are continually tending to advance inland. This is the Landes area, and the Maritime Pine, which is native, has been extensively planted to fix the

sand. The trees furnish notable amounts of resin and resin products (turpentine, tar, pitch, etc.). Despite such minor industries as the distillation of resin and some iron manufactures, especially on the slopes of the Pyrenees, the region is mainly agricultural.

4. *The Central Plateau.* We should expect this region to be one of low productivity, scanty population and difficult communications, and this expectation is generally fulfilled. But we have to note that the Upper Loire and its tributary, the Allier, rise far to the south, so that their valleys afford excellent routes in the north to south direction, and the Upper Loire flows so near the Saône-Rhone corridor that cross-routes become possible. Further, the Allier passes through an old lake bed, the Limagne, centring round Clermont-Ferrand, which is floored with fertile soil, and gives rise to an oasis of fertility, with vines, wheat and fruits, in a region which is generally one of poor pastures. The volcanic Auvergne, also, owes to its better soil the possibility of cattle-rearing, while sheep are common elsewhere. The unproductive limestone area of the south (the Causses) may be named as chiefly devoted to sheep. Except in such infrequent fertile areas as the Limagne the meagre crops consist mainly of the hardier cereals, such as rye and barley, with buckwheat, always a poverty crop in France. Though small coalfields occur manufactures are not important. Limoges makes porcelain, the china clay or kaolin being found near.

5. *The Armorican Plateau.* This is mainly a stock-rearing area, cattle, horses and pigs predominating over sheep. In Normandy and the Vendée dairying and poultry-farming are carried on, and Normandy grows apples for cider. Central Brittany and much of the south consists of poor heaths, but on the north coast particularly market-gardening is carried on and flax and hemp are grown. This is largely due to the extensive use of seaweed as a fertiliser for the rather poor soil. Seaweed is used

in the same way in the western islands of Scotland, but the latitude forbids the appearance of the special crops of Brittany there. As in the Hebrides, also, fishing is an important accessory occupation among the Bretons. Owing to the absence of coal only local small-scale manufactures are carried on, though Normandy has good deposits of iron ore. Brest is a naval arsenal and dockyard, while Cherbourg is both a Government dockyard and an important passenger port.

6. *The Alsace-Lorraine Region.* This is of complicated structure and relief, with a resultant diversity of products and resources. Nancy has a very important school of forestry, which reminds us that the Vosges and part of the plateau of Lorraine are wooded, making this one of the timber-producing regions of France. The great fortresses of Metz and Verdun, the battlefield of Sedan and the too-apparent traces of the last war recall the fact that a permanent frontier between France and Germany has been difficult to find here. The vines, wheat, hops, tobacco and other crops of the Alsace lowland are an indication of the fertility and sheltered climate of the Rhine Rift valley, while the water-power of the Vosges streams, the ease with which coal can be obtained from the rich Ruhr fields by means of the Rhine, and the possibility of importing raw material by the same route explain the development of textile industries, particularly cotton goods at e.g. Colmar. Of outstanding importance are the iron deposits of the Moselle basin, as at Nancy, Briey, and Thionville. The deposits were worked particularly during the period (1871-1918) when part of Lorraine was German, the ores supplying at that time the Ruhr iron industry. There is no coal near at hand, and though the Saar field was assigned to France for 15 years by the Treaty of Versailles, its coal does not coke well, as does that of the Ruhr. Strasbourg, on the Ill near its junction with the Rhine, is an important river port, commanding the Gap of Saverne (p. 26). Potash near

Mulhouse and rock salt near Nancy are other resources.

7. *The French Alps and Jura.* The French Alps, especially to the south, are less wooded, drier, and have generally less rich pastures than the Swiss Alps, and except in the area to the south of Lake Geneva (Upper Savoy) do not yield a large amount of dairy produce. Since sheep find abundant pasture on the plains of the Rhone delta in winter, but cannot stand the summer heat and drought there, what is called transhumance, or large-scale alternating movements of the flocks and their herds from the high pastures to the low, occurs, though the sheep are now mostly carried by rail. Grenoble, on the Isère, is a great glove-making town, since skins are easily obtained. Besançon, on the Doubs, is a watch-making centre. Many minor manufactures, including high-grade steels, paper and textiles, are carried on in the Alpine valleys with the help of hydro-electric power, but not on a large scale.

To this account of mainland France we may add that Corsica, though politically French, is Italian in character. Like Sardinia it is rich in minerals, fishing is important, and wine and olive oil are produced.

France has an area of 212,659 square miles, and a population of about 41 millions. Paris has a population of nearly three millions, but the only two other cities which exceed half a million are Marseille and Lyon. Of the total area some 8 per cent. is returned as entirely uncultivated and moorland, and nearly 19 per cent. as under forest. Wheat is normally produced in amounts nearly sufficient to feed the population, and France is one of the great wheat-producing regions of Europe.

Vidal de la Blache's *Tableau de la Géographie de la France* (Paris, 1905), with many maps and diagrams, is the best general book on the subject. The introductory section has been translated by H. C. Brentnall as *The Personality of France* (London, 1928). The same author's *Atlas Général* should also be consulted for its beautiful maps of France.

CHAPTER III

WESTERN EUROPE: THE BRITISH ISLES— NORWAY

STRUCTURE OF THE BRITISH ISLES. Structurally the British Isles are but a fragment of the continent, separated from it by the shallow, roughly quadrilateral North Sea. This flooded plain opens widely to the north, and southwards narrows, funnel-like, to the Strait of Dover, beyond which we have the larger funnel of the English Channel. That North Sea and Channel alike are but drowned portions of old land surfaces is obvious when we realise that S.W. England and S.W. Ireland are separated parts of a greater Armorican Plateau which once stretched north-westwards from Brittany (Fig. 1); that the London Basin is the equivalent of the Paris one; that in structure and characters parts of N.W. Scotland and N.W. Ireland are similar to Norway.

When we examine the build of the islands, we find that we can recognise three main elements, in each of which the relief shows at least a general correspondence to the nature of the underlying rocks. These three are the English Plain, the Uplands with their mineral wealth, and the barren Highlands.

In England, east of a slightly undulating line which extends from the Tees estuary to the coast of Dorset, all the rocks represented are geologically young (later Secondary and Tertiary), and at least relatively soft. Nowhere else in our islands is there any extensive area of these younger rocks, and this area constitutes the English

Plain proper. But in Midland England a wide western zone of early Secondary (Triassic) rocks appears, broken by outcrops of older and harder beds, and this belt extends to the west coast in the Cheshire Plain, thus giving the English Plain a narrower, north-western sea frontage, as well as its more extensive eastern and southern one. The same Triassic rocks extend southwards along the line of the Lower Severn valley, and the Severn estuary gives still another western outlet to the Plain.

The Uplands of England and Wales are built of older (Palæozoic) rocks, generally hard and resistant, and occur in three blocks (Fig. 7); in the south-western (Armorican) peninsula; in Wales, which is practically all Upland; in northern England (Pennines and Cumbrian Group). It is very important to notice that while as a broad generalisation we may say that England consists of a Plain to the east and of Uplands to the west and north-west, this statement suggests a continuous western barrier which does not in point of fact exist. The two breaks, the Bristol Channel, continued into the Severn estuary and Severn valley, and the Cheshire Plain, breached by the estuaries of Mersey and Dee, give the Plain what we may call functional continuity from east to west.

Rocks of similar type to those which form the Uplands of England and Wales extend into southern and central Scotland, and cover the greater part of Ireland. From the geological standpoint then we may say that these areas are the equivalent of the English Uplands, even though parts of them do not rise to any notable height above sea-level, and the less hard rocks included, such as the Old Red Sandstone, tend to form small plains. Finally, the Highlands of Scotland and of parts of N.W. Ireland are built of very old and very resistant rocks, largely of metamorphic origin, and are generally rocky and barren, without mineral wealth to compensate for their unproductivity. In Scotland particularly, where they attain their greatest extension, the Highland areas have

remained consistently aloof and marginal so far as main trends of development are concerned.

This brief survey gives us a picture of our country as it presents itself to a continental observer. To such an observer the English Plain is but a smaller continuation of the mainland basins and plains, characterised by a climate slightly less favourable to crop production, and almost encircled by relatively unproductive Uplands. Northwards the English Upland passes into the wider, even less productive Uplands of Southern Scotland. Ireland is more remote from England than is England from France, and so far as food crops are concerned has an even less favourable climate.

NATURAL RESOURCES. Since nature seems to have given relatively little, we naturally ask what has enabled Britain to become so densely peopled, and so important among the countries of Europe and of the world. It offers three main sets of resources to its inhabitants: the agricultural and pastoral products which can be won from its lands, particularly from the English Plain; the minerals of the encircling Uplands; the advantages of the position on the oceanic edge of a continent. English economic history may be said to be the story of the progressive utilisation of these resources. The Phœnicians came to Cornwall for tin; before the dawn of history earlier adventurers seem to have been drawn to Ireland by the search for metals, and to have found some scanty deposits of gold; we know that the Romans worked the extensive iron and lead deposits; the surface coal-beds were utilised relatively early. Nevertheless it is true broadly that the great value of the minerals of the Uplands was a late discovery. On the other hand, the fact that the English Plain would carry some, though not all, of the common crops of the continent, and that it was also suitable for stock animals, was too obvious to be missed. So long, however, as England was purely an agricultural

country, it could support only a small population, necessarily concentrated in the more fertile areas, and those with a climate suited to the growth of cereals. From Roman times right down through the Middle Ages, therefore, it was relatively poor and insignificant, dependent on the continent for civilising influences, having little to offer in return save the fine wool yielded by its sheep.

The first signs of a change came with the era of the Great Voyages of Discovery, when men's conception of the habitable world was widened. The marginal position, hitherto a drawback, now became a great asset; instead of being on the outer edge of the main world highways, the islands now lay between the old world and the new. The outer ocean ceased to be an untraversed waste and began to take over what had been the function of the Mediterranean Sea, that of serving as a link between lands of different products. Thus the relation of Great Britain to the inner and outer seas became important.

Before a country could take an active part in the voyages of discovery, access to the western ocean was essential. The republic of Venice had not this access, while Spain and Portugal possessed it to a marked degree. But the advantages of the S.W. peninsula of England (note the Devon ports) are nearly as great. Again, the first purpose of the voyages was the search for new routes to the wealth of the East. When eastern goods came by the Mediterranean route to Venice, her merchants could, if by difficult passes, transmit them to the markets of continental Europe. The obvious advantages of position enjoyed by Spain and Portugal in relation to the new ocean routes were largely neutralised in practice by their relative remoteness from these markets. England combined the advantages of easy access to the western ocean, and to the more populous parts of the continent.

Note in particular the relation of Bristol to London. The Bristol Channel and the lower part of the Severn estuary have so breached the western belt of Upland that

it is reduced to a very narrow strip, and even this strip is cut through by the Bristol Avon, so that there is no real barrier between Avon and Kennet and thus Thames. Thus Bristol could receive ocean-borne goods, in early days necessarily valuable in relation to weight and bulk, and transmit them to London, whence they could again be distributed to the continent. The immediate consequence of the discovery of the new trade-routes, however, was not a great and sudden accession of wealth, as with Spain and Portugal, but the growth of an appreciation of the importance of sea-trade and of the command of sea-ways.

The next series of changes was of much later date. Not till Watt's work in improving the steam engine in the late 18th century did it become clear what an enormous amount of potential power is stored in our coalfields. That power was used in large-scale manufactures, and with these came a fuller utilisation of the advantages of position. Within the country again there was not only a rapid increase of population, but a notable change in its distribution. The margins of the Uplands, where coal and iron were worked, became the most densely-peopled areas, instead of the fertile Plain. But London, though somewhat remote from the great coalfields, was able on account of its position to maintain, and even to increase, its predominance. If then England differs from France and resembles Germany in that many of its chief towns are products of the age of machinery, rather than the results of centuries of development, it yet differs notably from Germany and resembles France in that its capital has a long tradition behind it, and was not constructed deliberately to meet new conditions. The fact is of much significance. It reminds us that we must not exaggerate the extent of the change-over from the predominantly agricultural to the predominantly industrial mode of life, of the shift of the centre of gravity from the Plain to the margin of the Uplands. London is essentially the heart

of the Plain, and it is almost as true to say that the industrial period has enabled London to annex the previously distant Uplands to its sphere of interest, as to claim that the large-scale industries have caused the Plain to lose its significance in the national life. Apart even from London other cities of the Plain, if relatively small as compared with the industrial towns, have yet retained their traditional influence. If then we think of France as a country with a continuous agricultural tradition, and of Germany as the typical modern industrial state, we have to remember that England shows a characteristic blend of the two trends of development, and through all the historical changes has never wholly lost touch with the past.

THE ENGLISH PLAIN. This has a characteristically grained or zoned structure, the more resistant beds, mainly limestone and chalk, alternating with softer beds, especially clays and alluvium, so that rounded hills margin vales or coastal plains (Fig. 7). From the Cotswolds to the Cleveland Hills, Jurassic limestones outcrop at the surface, having often a steep scarp on the north-west front, while south-eastwards they dip gently below younger beds. From Dorset to Norfolk an almost parallel belt of chalk appears, with the Chiltern Hills as its most conspicuous element. If we think of these strips, with their south-west to north-east direction, as forming the ribs of the Plain proper, we find that its wide southern continuation is similarly supported by a much dissected belt of chalk which runs nearly due east from Dorset to the coast of Kent and Sussex, where it is broken off sharply. In the east this chalk belt is so dissected that we have two definite lines of hills, the North and South Downs, bounding by steep scarps the Weald area, with its marginal low-lying clays and central higher, because harder, sandstone hills. Westward the dissection is less complete, so that the two lines of the Downs merge into the single, broader chalk belt which forms the

Hampshire Downs and Salisbury Plain. This belt stands back from the sea, so as to half-encircle the low-lying Hampshire Basin and Vale of Dorset, west of which the chalk again approaches the coast. The Hampshire Basin (note Winchester) is the southern equivalent of the London Basin, which lies in the region where the south-west to north-east belt of the chalk which forms the Chilterns converges to meet the west to east belt which gives rise to the Downs. But the river systems have pierced the low hills so that neither the London Basin, nor the Hampshire one, nor even the Weald, have the isolation that verbal description suggests. Everywhere there are gaps; note particularly the St. Albans gap in the Chilterns; the Goring gap where the Thames breaks through between the end of the Chilterns and the White Horse Hills; the Guildford, Dorking and Maidstone gaps in the North Downs; the numerous passage ways through the South Downs and their continuation, as well as the ease with which the west can be reached by the valley of the Upper Thames or of the Kennet.

THE WESTERN MARGIN OF THE PLAIN. This survey indicates the physical basis of the original England, of the Plain with its chalky hills suitable for sheep, and its vales and coastal belts capable of yielding wheat. The only considerable river system is the Thames, the tributaries of which afford innumerable lines of access to the bridge-town of London. Because the Jurassic limestones can be traced nearly continuously on a relief map from the Cotswolds by the Northampton Upland, Lincoln Edge, and after a break to the North York Moors and Cleveland Hills, we may think of this elevated belt as forming the margin of the Plain in the limited sense. Westward lies a wide tract marking the transition between agricultural England and the newer England of the great coalfields. Its centre and broadest part is the Midland Plateau, with Cannock Chase, Charnwood Forest and the Clent Hills marking the more prominent rises in an

area nowhere really high. Two considerable trunk-streams—the Severn-Avon and the Trent—carry water from this plateau to the sea, and Severn, Avon and Trent



FIG 7—THE STRUCTURE OF THE ENGLISH PLAIN, SHOWING THE RIBBED OR GRAINED APPEARANCE DUE TO THE ALTERATION OF HARD AND SOFT BELTS OF ROCK.

1. The clay vales and lowlands ; 2. The hill belts ; 3. The western Uplands built of ancient folded rocks.

alike show by their strings of historic towns that their valleys have agricultural resources and have always served as lines of communication. Some of these towns have been “rejuvenated” in modern times, either because coal outcrops in the neighbourhood, or because it can be worked with profit beneath a surface covering of younger

beds, so that modern industry becomes possible. Where this occurs the original market town tends to grow in harmony with the new needs; the birth of clusters of towns, with no obvious advantage of position apart from the access to coal, which is so conspicuous a feature of the great coalfields, does not take place. Again, because the historic towns owed their origin to their relation to natural lines of communication, we find that they have frequently become important railway stations (Rugby, Shrewsbury).

As examples of such towns we may note Gloucester, Worcester (porcelain, gloves), Kidderminster (carpets), Shrewsbury in the Severn valley, Evesham (centre of a fruit-producing area), Stratford, Warwick, Coventry, Rugby in the Avon valley. Coventry is much the largest of these, and its industries have shown a curious series of changes. Originally a woollen town (local wool), an influx of French Protestant refugees in the early 18th century resulted in the establishment of the manufacture of silk ribbons and watches. Coal is available from the small Warwickshire (Tamworth and Nuncaton) and Leicestershire (Ashby-de-la-Zouch) fields or the larger South Staffordshire one. Competition from other countries has led to the replacement of silk ribbons by artificial silk, watches by bicycles, motor-cars, sewing machines, and so forth.

The valley of the upper Avon is practically continued into that of the Soar, with Leicester, originally again a woollen town, long famous for its stockings, but like Coventry adapting itself to changing times by developing new manufactures (lace, elastic webbing, boots and shoes, machinery). Other towns of the Trent system are Stafford (boots and shoes), Burton (beer), Derby (porcelain), Nottingham (cotton goods, such as stockings, lace, curtains, etc.). Derby and Nottingham both lie near, though not strictly speaking on the Yorks., Derby and Notts. coalfield. Further north Doncaster, on the Don,

and York, on the Ouse, are other examples of historic towns more or less modified by the development of industry. Doncaster manufactures railway rolling stock, concealed coal measures being worked near by.

The agricultural resources of the areas served by these towns lay originally in the possibility of combining crop production with stock-rearing. But the climate is less suited to wheat than that of the Eastern Counties, and with increasing competition from imported corn the tendency is to concentrate on products for which there is much local demand. Thus we have fruit-growing in the lower Avon valley, barley-growing for beer in the Trent valley, cattle-rearing for dairy produce and meat almost everywhere.

In the heart of the Midland Plateau, in a region with few obvious advantages so far as surface features are concerned, lies the great complex of Birmingham, with its ring of satellites—a typical product of the coal period when wealth comes not from agricultural resources, nor the control of highways, but from hidden stores of minerals. Thus the sterilisation of the surface by pit-shafts, factories, dwellings, railways, roads and canals is but an indication that it is the deeper layers, and not the surface soil, which have become important in men's eyes. From the 16th century Birmingham, previously an unimportant settlement, began to flourish as an iron centre, smelting being carried on with local wood (note the Forest of Arden). From the later 18th century the working of the extensive coal beds in the neighbourhood made greater developments possible, and Birmingham became renowned for all kinds of metal goods. The relative remoteness from the sea proved a drawback as competition increased, but the inhabitants have shown both great adaptability and ingenuity, and have overcome the difficulty of relatively costly transport by concentrating on goods requiring skilled labour rather than much raw material.

It is customary to emphasise the central position of Birmingham in relation to the ports of Thames, Severn, Mersey and Humber; but Gloucester, the nearest port, is of no real value, despite the Berkeley ship canal. Much more important is the Mersey estuary, to which Birmingham has access by the Midland Gate, the narrowed gap where the Pennine Upland approaches most nearly the Cambrian one. This leads to the wide Cheshire Plain, drained by the Weaver (note the important railway junction of Crewe) and the Dee.

To the south-east of the Cheshire Plain, and strictly within a continuation of the Pennine Upland, lies the somewhat isolated industrialised region of the Potteries, situated round the Trent headstreams. The river is formed by small converging streams, flowing in a depression which is bounded to the east by an area where millstone grit outcrops and to the west by the Triassic rocks of the Plain, and is itself floored by Coal Measures. On the most westerly of the streams stands the old market town and route centre of Newcastle-under-Lyme, while a little further east, where the coals, clays and marls of the North Staffordshire coalfield are within reach, arose the originally separate pottery towns of Hanley, Burslem, Stoke, Longton, Tunstall, and Fenton, now amalgamated as the city of Stoke-on-Trent (nearly 300,000). Here from the 17th century onwards rough earthenware was made as a domestic industry, and Josiah Wedgwood (1739-95) was instrumental in converting this into the "elegant art" of china-making.

Except for the local coal and the coarse clay required for the saggers or cases in which the pots are fired, practically all the materials have to be imported; kaolin or China clay from Devon and Cornwall, flints from Norfolk and Normandy, felspar from Derbyshire and Norway, bones (for bone ash) from South America, and so on. The persistence and development of the industry is a striking illustration of the effect of tradition and of the genius

and foresight of the founders. Wedgwood, in addition to his work as potter, was largely instrumental in causing the Trent and Mersey canal to be built as a means of connecting Liverpool and Hull with the Potteries, and thus facilitating the import of raw materials. This canal, which still retains much importance, runs from Runcorn on the Mersey to Long Eaton, six miles above Nottingham, passing through Stoke. It thus links the town to the navigable section of the Trent, which for barge traffic begins at Burton.

No less striking than the great development of the Pottery towns is the continued aloofness of Newcastle-under-Lyme, now mainly a residential suburb of Stoke, which has consistently striven to preserve its own historical traditions as against the growing industrialism of its neighbour. The latter, in addition to the main industry and to coal-mining, carries on an important iron and steel trade owing to the presence of "blackband" iron ores, present here as in Lanarkshire (p. 58).

THE UPLANDS. Least important of these economically is the south-western block. Tin is still produced, as round Camborne and Redruth, but not now copper, granite at Penryn and on Bodmin Moor, and slate near Camelford; but only the kaolin mined behind St. Austell and near Newton Abbot is of much value. The port and dockyard of Plymouth (cf. Brest) reminds us of the earlier value of the peninsula as a basis from which a bid for sea power could be made, but Portsmouth and Southampton have now greater advantages, and most of the harbours of Devon and Cornwall are only fishing-stations. The peninsula supplies London with early flowers and vegetables, and with dairy produce, and offers many holiday resorts, having thus a relation to the metropolis similar to that of Normandy and Brittany to Paris. The two latter areas, however, also come into London's sphere of interest economically, despite the political frontier and the water barrier. The Channel

Islands, geographically French, politically and economically English, quite similar in their products to the Scilly Islands, are but another proof that, with the development of modern shipping, the physical break between the two main sections of Armorica counts for little, and that the pull of London, with its larger population, is stronger than that of Paris.

The Welsh Upland, with its marginal coalfields, has been more profoundly modified by the growth of large-scale industry. Originally an area of poverty, with little to give save wool from the mountain sheep, coastal fishing and some possibilities of farming in the narrow valleys and coastal plains, it has undergone evolution along two distinct lines. The larger part has been annexed economically to industrial England; while the southern coalfield has been the seat of great and independent developments. The dense masses of workers clustered on the English coalfields require opportunities of obtaining fresh air and exercise; the larger towns must have enormous supplies of pure drinking water. What, then, does Wales mean to the inhabitants of the industrial areas? Primarily holiday resorts (Llandudno, Barmouth, Aberystwyth, etc.), but also reservoirs fed by the abundant rainfall which leads great municipalities, like those of Liverpool and Birmingham, to acquire tracts of hill-country (catchment basins), and construct costly water-works. The fact that certain local developments have taken place, such as the working of the slates of Carnarvon and the coal of Flint, hardly affects the truth of the general statement.

Very different are the conditions on the South Wales coalfield. Geologically the field forms a trough elongated from east to west, from Pontypool to St. Bride's Bay. With the shape and structure is associated a progressive change in the nature of the coal from east to west. In the east and north-east it is bituminous, cokes well, and is equally suitable for smelting and for domestic use.

Here also (Dowlais, Ebbw Vale) it is associated with iron ore. In the centre, as at Merthyr Tydvil, Aberdare and the Rhondda Valley, it is semi-bituminous, giving off little smoke and leaving little ash when burnt. This steam-coal is particularly valuable for shipping. In the north-west anthracite, or true smokeless coal, occurs.

The seams outcrop on an upland standing slightly back from the sea, but the two bays of Carmarthen and Swansea penetrate the land sufficiently to bring some pits quite near ports, as at Llanelly and Port Talbot. Everywhere the upland is dissected by short streams, whose steep valleys afford a number of lines of access to the coast (note the position of Cardiff and Swansea).

From these facts it is fairly easy to deduce that the area will export coal, especially steam-coal (Swansea, Cardiff, Newport), and also use its coal in metallurgical industries. The superiority of Spanish ores to the local ones has led to the shift of the iron industry from the interior to the coast (Cardiff). The original access to the tin and copper of Cornwall has given Swansea very varied smelting industries, though tin is now imported from the Straits Settlements, Nigeria and Bolivia, and copper from Spain and elsewhere. Tin is used largely in the manufacture of tin-plate, for what we call "tins" and the Americans "cans," tin-plates being thin sheets of iron coated with tin after being dipped in a bath of hot palm oil. The effect of these developments was to lead to a large increase of population and wealth within a very cramped space, in an area with earlier traditions only of poverty and scanty population. Post-war depression in trade has brought a new and more acute poverty problem.

The Northern Upland consists of the Pennines and the Cumbrian Mountains, to which the former are linked by Shap Fell. It shows a combination of advantages which explains why this area was the seat of the great industrial experiments.

Physically, Northern England is a narrowed belt of land, separated by a "waist" from Southern Scotland, and widening to the south. The Pennine Chain occupies the centre only, leaving space at either side for natural south-to-north highways. That these highways were utilised early is indicated by the rows of historic towns which mark their course; Doncaster, York, Durham, Newcastle may be named on the eastern route; Chester, Lancaster and Carlisle on the western. All these are now stations on main railway routes; some (Carlisle, Chester, York) are important railway junctions. Even where, as notably at Newcastle and Durham, the original significance of the site has been partly blurred by later changes, castle and cathedral remain to remind us that there has always been traffic, both through and local, along these routes.

The drainage system is of great interest because of its bearing on lines of communication and sea outlets. Generally the tendency is for numerous separate streams, rising in the Pennines, to flow directly eastward or westward to the sea, to which they open by sheltered estuaries. The headstreams approach one another, or even interlock, giving rise to easy cross-routes, such as the Tyne and Aire Gaps. To this general description the Ouse forms a notable exception, for it is a trunk stream, running parallel to the Pennines, and gathering a number of smaller tributaries from the narrow dales. But it should be noted that the chief streams which drain the South Yorks., Derby and Notts. coalfield are the Aire, with its tributary the Calder, and the Don. Though the Aire is regarded as a tributary of the Ouse, in point of fact it joins that river not far from the point where it expands into the Humber estuary, to which the Don and Trent also flow. Thus Aire, Calder and Don may be regarded as forming direct lines of access from the coalfield to the sea, making Hull its outlet, with Goole as a subsidiary port. Further north the Tees, Wear and Tyne, with the

less important Wansbeck and Coquet, afford sites for ports in direct communication with the Northumberland and Durham field. On the west the bottle-necked Mersey estuary, with its twin outports of Liverpool and Birkenhead, and, owing to the ship canal, its inner port of Manchester, is the outlet of the South Lancashire field. The valley of the Eden, a stream which in relation to the Pennines resembles a miniature Ouse, is of much importance as a line of communication; the course of the two railway routes into Scotland which converge at Carlisle should be carefully noted. The numerous small ports at the mouths of rivers originally served as fishing-stations, but now the industry tends to be concentrated at the larger ports (note particularly Grimsby).

In addition to the three main coalfields already named, and the North Staffordshire one discussed on p. 44, we have to note also the smaller Cumbrian field. It resembles the Northumberland and Durham field in that the seams approach the coast, and are even continued beneath the sea, while the other fields lie on the actual margin of the Pennine Upland. These inland coalfields therefore use their coal mainly for local manufactures, while the Cumbrian field exports coal, especially to Ireland, through the ports of Whitehaven, Maryport and Workington. The Northumberland and Durham field uses part of its coal for its shipbuilding, engineering, chemical and other industries, but exports large amounts, particularly to the east coasts of England and Scotland and in normal times to the continent, and supplies also much coastal shipping.

In addition to coal Northern England yields other valuable minerals and rocks. Iron ores occur both with coal and as separate deposits (Barrow region, Cleveland Hills); the Pennines yield lead; the Cumbrian Mountains slate and granite; salt is found in the Cheshire Plain and in the Tees valley. Of other resources local wool is

important as the starting-point of the great textile industries.

Here then we have the essentials of the setting of the three great industrialised areas of northern England, which have played so leading a part in ensuring the commercial supremacy of the country. These three are : (1) the South Lancashire area ; (2) the West Riding region with its prolongations ; (3) the North-eastern area. Each has well-marked characteristics of its own.

(1) *The South Lancashire Area.* Here the cotton industry, the greatest of British industries, predominates, but there are a number of subsidiary manufactures which have arisen as a result of Liverpool's wide trade relations with overseas lands. In contrast to most British industries, that of cotton has always been wholly dependent on imported raw material ; there have been constant changes also alike in the sources of the raw cotton and in the markets available for the finished goods. Both facts have exercised much influence on the people of Lancashire, who pride themselves on their wide outlook and on their readiness to adjust their products to changing conditions.

The position of the manufacturing towns, that is of the areas of almost continuously dense population, depends upon the detailed structure of the coalfield. From the Pennines there extend westward two spurs, the Bowland Fells, the higher and more northerly, lying between the Lune and the Ribble, while from the lower Rossendale Fells arise to the north the Calder tributary of the Ribble, and to the south the Irwell and other right-bank tributaries of the Mersey. From the Bowland Fells, as from the Pennines proper, the coal measures have been stripped by denudation, exposing the older, non-productive formations beneath. This is partially true also of the Rossendale Fells, which consist mainly of millstone grit, with some not very important coal beds. But on the southern flank of the Fells lies a broad

belt of coal measures, containing seams which are worked in an area forming an irregular crescent, and extending from near St. Helens through Wigan and Leigh, then across the Irwell to the east of Manchester and the north-east of Stockport on the upper Mersey. Further, on the northern flank of the Fells, though to a less extent, valuable seams are again worked, particularly in the Calder valley round Burnley.

The carboniferous rocks, coal-bearing or not, are separated from the sea by the younger beds which floor the Lancashire Plain; the coal measures are faulted too deeply beneath these younger beds to be reached. Faults also occur on the southern margin of the basin, which is in like manner separated from the Mersey by a lowland underlain by younger rocks.

These two facts, the division of the coalfield into a larger and more productive southern portion and a smaller northern one, and the way in which as a whole it stands back alike from the sea coast proper and from the estuaries of Mersey and Ribble, have both had permanent effects. From the first results the division of the cotton towns into two sets, the mainly weaving towns to the north and the mainly spinning ones to the south. The second has deprived the coalfield of much importance as an exporting area, and has kept the textile towns crowded together on the edge of the uplands, in the narrow valleys which originally supplied water power.

The spinning towns extend from Bolton through Bury to Rochdale, then south past Oldham to Ashton and Stockport. This region has a high, well-distributed rainfall, a moist atmosphere and a small range of temperature, all important factors in spinning as permitting cotton thread to be subjected to high tension without snapping. Manchester is mainly a commercial centre, but spinning is still carried on on its outskirts. Its position at the convergence of small streams (Irwell, Irk, Medlock) should be noted as well as the narrowing of

the Pennine axis to the east, which gives it easy communication by canal and rail with the West Riding. Part of the yarn made is exported, but much is sent to the Ribble towns, such as Preston, Blackburn, Accrington, Burnley, Nelson and Colne, to be woven into cloth. Preston is the most interesting of these towns. It is engaged both in spinning and weaving, has an engineering industry and is a market centre for the agricultural plain. Yet as a port it is handicapped by the sandbanks of the Ribble estuary, and—in the pre-railway sense—is relatively distant from coal, which was first brought to it by sea from the Mersey after having been carried to that river from near St. Helens by canal. Its position at a river crossing (cf. Warrington on the Mersey) should be noted ; but the skill and enterprise of its people count for much, as witness recent developments in the artificial silk industry.

The towns on both sides of the middle and lower Mersey engage in a great variety of industries, partly dependent on the Cheshire salt beds. Thus St. Helens makes glass, Widnes and Runcorn chemicals of various kinds, Port Sunlight soap, and so on. There is also much engineering.

(2) *The West Riding Area.* The outstanding feature of this region and its continuations is the elongated belt of exposed coal measures, which stretches, narrowing southward, from Leeds and Bradford in the Aire valley nearly to Nottingham on the Trent. The field is backed by millstone grit, yielding abundant soft water for washing raw wool. To the east the measures disappear beneath a covering of Permian (magnesian limestone) and Triassic beds, but, in striking contrast to the conditions in Lancashire, they can be worked beneath these in deep mines. It is this concealed field which has been progressively developed since the middle of last century, and there are great modern pits round Doncaster, and also near Mansfield and Nottingham further south.

The northern part of the exposed field, between the

Aire and the Calder, forms the woollen area. Its five large towns, Leeds, Bradford, Halifax, Huddersfield and Dewsbury, include more than a million people, and there are many smaller ones. Leeds, on the Aire where the valley opens out, is not now purely a woollen town, being the commercial centre of the whole district, with a large variety of industries.

South of the Calder the industries change in character. Barnsley, on the Dearne tributary of the Don, is a great coal-mining town, and manufactures linen, an industry once widely spread both in Lancashire and Yorkshire. The Don, which makes a sharp bend within the town of Sheffield, is the seat of a great iron and steel industry. The river appears to have changed its course owing to captures in its basin, but the essential feature is that from Penistone to Sheffield it runs roughly parallel to the Pennine Upland, and at Sheffield receives four small and rapid tributaries (of which the Sheaf is one), and is itself coursing down a steep valley. The valleys were originally forested, supplying charcoal for smelting; local iron ore and hard stones for grinding steel were present; the streams furnished power for blast furnaces; ganister or resistant sandstone is available for furnace linings. These facts were the basis of the original cutlery industry, carried on in small water mills, strung along the narrow valleys. From it was developed the great steel and iron industry of to-day, with few obvious local advantages save coal and tradition—or “geographical inertia.” The cutlery industry persists, especially on the higher sites to the south and west, but the valley between the elbow bend and Rotherham concentrates on heavy goods, including ship plates, armour plates and ordnance, made largely from imported ore.

Further south, as at Chesterfield, Mansfield, Derby and Nottingham, an iron industry is again carried on, chiefly with ore obtained from the Jurassic beds of Lincolnshire and Northampton. The textile industry also reappears,

towns in the Derwent valley, such as Belper, making yarn for the lace and hosiery of Nottingham.

Hull (Kingston-on-Hull), which arose on a sheltered creek where a small tidal stream enters the Humber estuary, is the port of the basins of Ouse and Trent. A good deal of coal is exported, chiefly from the newer part of the field. Efforts are being made to increase the direct import of raw wool, which used to pass through London and, to a smaller extent, through Liverpool. The largest import, however, consists of oil-seeds, the basis of important industries, such as the making of cattle cake, refining oils, and producing fertilisers. There is extensive trade with the Baltic.

3. *The North-Eastern Area.* This is characterised by the limited number of its industries, and particularly by the absence of textiles. The latter fact means that there is little outlet for female labour in industry. Women are more extensively occupied in outdoor agricultural work in Northumberland than is common in other parts of the country. The export trade in coal is very old, for the Tyne sent coal to London so far back as the 12th century, and is very important, the field supplying about one-third of the coastwise and foreign shipments of Britain. On the other hand, the great development of the iron and steel industry dates only from the latter part of the 19th century, and Middlesbrough is the most recent of the large towns of England. Thus the area presents two special features of interest. Obviously there must be peculiarities of structure and relief, which made the working and shipping of coal easy even when methods of mining and transport were primitive, and continue to exert influence to this day. Again, on that ancient trade was superimposed a distinctively modern industry, which has its seat in part in the areas first developed and in part in entirely new towns.

The coal measures are exposed in an elongated field extending from the lower Coquet to a few miles south of

Bishop Auckland, which stands at the bend of the Wear. From the Coquet to the Tyne the exposed measures front the sea, but south of the river they trend gradually away from it, being concealed to the east under a covering of Permian rocks. This concealed field extends to the mouth of the Tees. As already noted the whole region is drained by rivers flowing direct to the sea, of which the most important is the Tyne, always navigable for sea-going vessels to Newcastle, some ten miles up, and for the local, flat-bottomed, coal-carrying "keels" for a few miles further. The Tees is navigable to Stockton.

Here then is the natural basis of the coal export trade throughout the centuries. In early days only the surface or shallow-seated deposits could be worked, and the main problem was to get the coal to the rivers. There it could be loaded on the keels, which in their turn loaded the sea-going ships. South of the Wear export was impossible, both because the concealed measures in the east could not be worked, and because the exposed beds further west were out of reach of navigable water. How important was the latter fact can be judged by recalling that the first railway, the Stockton-Darlington line opened in 1825, was built to carry coal from South Durham to the navigable Tees. Before its construction coal was actually sent by sea from the Tyne to the Tees mouth, the land haul, short as it was, making it difficult to use the coal in the neighbourhood. Improvements in mining methods, which made it possible to work deeper deposits, and in means of communication, account for the continual growth in the export of coal as the demand elsewhere increased.

It only remains to add that the early and extensive use of keels on the Tyne played an important part in establishing the shipbuilding tradition. The local demand, and the ease with which the boats could be constructed at first from home-grown and later from Baltic timber, led to the development of skill and the accumula-

tion of some capital in advance of the period when sea transport entirely changed in character.

The South Durham coal, in contrast to the hard steam coal found especially in the more northerly area, proved to be an excellent coking coal. In 1850 it was discovered that the scarp of the Jurassic beds of the Cleveland Hills, overlooking the Tees estuary, contained rich seams of ironstone, while limestone for flux occurs in the Permian beds already mentioned, as well as elsewhere. These correlated facts account for the great development of the iron and steel industry, and the rise of Middlesbrough. West Hartlepool, to the north of the estuary, apart from its shipbuilding, is mainly concerned with the export of the coal won in the great modern collieries sunk through the Permian beds to the concealed measures below, and with the import of pit-props from the Baltic. It has to be noted, however, in connection with the whole Tees area, that Spanish and Swedish ores are largely imported, in addition to the use of Cleveland ore.

It is thus clear that the momentum of the going concern is everywhere in evidence in Northern England, even if there are indications of a tendency for the newer industries, such as the making of artificial silk and electrical apparatus, to become localised in the plain to the south, rather than in the industrial north.

Area of England and Wales 58,340 square miles. Population 39,000,000. Greater London, the largest town in the world, has a population of nearly eight millions. No other town reaches the million mark, but Birmingham, Liverpool and Manchester approach it. Only about 27% of the surface is arable as compared with nearly 42% in France, and there is little productive woodland.

SCOTLAND, both in structure and relief, is at once broadly simple and complex in detail. Two great fault lines, one, the Highland Line, running from Stonehaven to Helensburgh, and the other from Dunbar to Girvan, appear to divide it into three natural regions, the Midland Valley, the Southern Uplands and the Highlands, each with well-defined characters. But though the approach

of the Grampian Highlands to the sea near Stonehaven seems to mark a limit, we find that further north the hills again retreat from the coast, leaving plains which, e.g. round the Moray Firth and in Caithness, are floored with Old Red Sandstone rocks, just as are some of the most fertile regions of the Midland Valley. If then we say summarily that the Highlands are barren and scantily peopled, the Midland Valley fertile, coal-yielding and densely peopled, we have yet to remember that of the four large towns of Scotland one (Aberdeen) lies within the Highland Line, and that wheat is produced round the Moray Firth, an area even further within the Line than Aberdeen.

The Midland Valley itself is less uniform than the name suggests. A belt of volcanic hills, of which the most conspicuous elements are the Sidlaws, Ochils, Campsie Fells and Renfrewshire Heights, traverses it obliquely from coast to coast, broken by three gaps cut respectively by the rivers Tay, Forth and Clyde. Of the two lowland sections so produced the north-westerly, which forms Strathmore in the larger sense, is predominantly agricultural, while the south-eastern belt with its coalfields shows a combination of agriculture and industry. Coal is worked in Ayrshire, where the beds approach the ports of Ardrossan and Irvine; on the large Lanarkshire field, the seams reappearing across the Forth in the Clackmannan field; in Fife and on the opposite shore of the Firth of Forth in the Lothians, the intervening section being sunk below the sea.

The Firths of Forth and Clyde bear to one another a relation somewhat similar to that of the estuaries of the Mersey and the Humber, with the marked exception that no upland belt intervenes and that the distance from estuary to estuary is much less (under 30 miles). If Edinburgh (with Leith, over 400,000) be regarded as the equivalent of Hull, and Glasgow (over 1,000,000) of Liverpool, then we find that in each case the Scottish

town is larger than its English analogue, but that compared with the English area the other Scottish industrial towns are mostly small. The development of industry in Scotland is associated essentially with the growth of Glasgow and its satellite towns, the growth of the eastern towns, including Dundee, being largely of the nature of a reflex effect.

As compared with England there was a marked "lag" in industrial development. Not till 1707, when Glasgow was able to take part in the trade with the North American colonies of Britain, did its westerly position count for anything; the Act of Union, that is, marked Scotland's "discovery" of America. As against English competition, the cheaper labour was exploited, hand-woven coarse textiles, first linens and then cottons, with salt herring, both for the use of the slaves, being exchanged for tobacco, sugar and rum. The rapid development of steam-driven looms in industrial England led to a relative decline in the Scottish textile industry. From about the middle of the 19th century, however, the discovery of a way of using the "blackband ironstone" of the western coalfields laid the foundation of the Scottish iron industry, with its derivatives, such as shipbuilding, engineering and so on. Blackband ores contain a certain amount of coal-like matter, which diminishes the cost of smelting. The iron industry is still very important, even though now most of the iron ore has to be imported.

We may think of the wave of prosperity thus originating in the Clyde area as travelling outwards until blocked by the barren areas of the North-West Highlands, and the more elevated central area of the Southern Uplands. Within the latter, the tweed-making towns of the Middle Tweed Valley, the prosperous farm lands of the Lower Valley, the dairying industries of the southern counties, the fruit-growing of the Upper Clyde Valley, all remind us that the really unproductive lands are of limited extent as compared with the Highlands. In the

Highlands there are the beginnings of industries based on hydro-electric power, as at Kinlochleven (aluminium smelting). A larger scheme for utilising water-power is in progress (Lochaber scheme).

Area of Scotland about $30\frac{1}{2}$ thousand square miles. Population nearly five millions. Only four towns have more than 100,000 inhabitants, these being Glasgow, Edinburgh, Dundee (171,000) and Aberdeen (158,000).

IRELAND, geologically, may be said to be built of fragments of the western Uplands of Great Britain, linked together by a boggy central plain, which is floored by limestone rocks. Thus the Mourne Mountains are composed of the same rocks as those which form the Southern Uplands of Scotland, and the Loughs of Carlingford and Strangford recall the similar bays on the opposite shore. The basaltic plateau of Antrim, with the large, shallow, Lough Neagh in the centre, is due to the same volcanic outbursts as the island of Mull and part of the adjacent Scottish mainland. A depression stretching south-westward from Lough Neagh is a continuation of the Midland Valley of Scotland, the little coalfield of Dungannon, in Tyrone, emphasising the fact. The Wicklow Mountains are formed of the same rocks as the Welsh Upland, and we have already emphasised the resemblance between South-West Ireland and the south-west peninsula of England, and between Donegal and the North-West Highlands of Scotland. The surface has, however, been greatly worn down by the agents of erosion, and even these marginal areas do not form extensive or continuous areas of high ground.

The central plain, lying between lines drawn from Dublin to Galway and from Dundalk to Ballina, opens widely to the east, but has narrow exists only to the west through Killala, Clew and Galway Bays. It is divided by the Shannon, the longest river in the British Isles, remarkable for its slow upper course and its rapid descent after it breaks through the Killaloe gorge. It is near the

outlet from Lough Derg that a weir has been built, in connection with the electrification scheme, water being carried in an artificial channel to a power house at Ardnacrusha, a few miles above Limerick. It is hoped that cheap electric power may increase industrial development in Ireland. The width even apart from Loughs Derg and Ree, and the unstable boggy banks, have always made the Shannon a barrier rather than a main line of communication. Within the country generally there is a remarkable absence of converging routes. The concentration of the railway system on Dublin is the result of the economic dependence on England, and of the town's position opposite the Mersey estuary and the Midland Gate, rather than of the build of Ireland.

If Dublin marks the spear-point of English invasion, and Cork suggests the Bristol of an earlier England, the proximity of north-eastern Ireland to the Midland Valley of Scotland has rendered possible there developments at once linked and independent. Like the Clyde towns, Belfast has a shipbuilding industry, though both coal and iron must be imported; like the Fife towns, Belfast, Londonderry and the associated towns manufacture linen. In this case the local production of flax gives an apparent advantage to the Irish area, but flax used to be grown in Fife.

The remainder of Ireland, the Irish Free State, is chiefly pastoral, rearing cattle for the English market, to which also it sends much dairy produce. Despite the position trade relations with America are carried on mainly through English ports; Ireland, that is to say, looks eastward towards the richer neighbouring island, has not functionally a double outlook, like England and Midland Scotland.

Total area of Ireland, about $32\frac{1}{2}$ thousand square miles. Northern Ireland consists of the counties of Antrim, Armagh, Down, Fermanagh, Londonderry and Tyrone, with the parliamentary boroughs of Belfast and Londonderry. The population is about $1\frac{1}{4}$ millions, of which more than one-third (over 400,000) live in Belfast.

The Irish Free State has a population of nearly three millions in an area of about $26\frac{1}{2}$ thousand square miles. Greater Dublin is only slightly larger than Belfast; no other town reaches 100,000.

NORWAY is usually discussed with Sweden, to which it was united politically till 1905, but its resemblance to Highland Scotland, with which in earlier times its relations were close, make it better to include it here. It differs from the North-West Highlands in its timber resources (about one-fifth of the total surface is woodland), in being more plentifully supplied with minerals (iron, copper, silver, etc., but not coal), and in its much greater resources of water-power (utilised in metallurgical industries comparable to those of Highland Scotland but much more important, and also for making paper pulp, etc.), but resembles them in the large tracts of unproductive land (reaching some three-quarters of the total), in the importance of the fisheries, and in climate as well as in structure. Norway approximates in size to Great Britain and Ireland combined, but has a population ($2\frac{3}{4}$ millions) less than that of the Irish Free State. The only town of any size is the capital, Oslo (260,000).

The west coast, with its skerry guard of islands bounding sheltered waters within, forms a striking example of a fiord coast. As contrasted with rias, such as those of south-west Ireland, which shallow steadily landwards, fiords have a sill at the entrance, with deeper waters within, and are often much branched. Typically their walls are steep, so that streams plunge downwards in waterfalls. But at their heads, and occasionally at other places where considerable streams enter, alluvial flats are present on which cultivation is possible, while on the glacial shelves of the plateau above summer pasturage can be carried on. Such narrow lowlands form sites for settlements, sea-fishing and stock-rearing supplementing the yield of the arable strip. But expansion is impossible, so that emigration must take place.

Such small, isolated settlements are, however, but one

part—and that the less important—of the essential Norway. Trondhjem, an ancient capital, stands on a great fiord, hardly typical since it penetrates a depressed area between the narrow northern upland and the wider and higher southern one. From it there leads southwards an almost continuous valley, formed by the Guldal to the north and the Glommen to the south, expanding at the head of the Skaggerrak into the wide, lake-sprinkled lowland, in the centre of which is the fiord on which Oslo lies. Its status as capital dates from the period of Danish rule. It is this lowland area with its milder climate, its lands better fitted for agriculture, its wealth of wood, its position with respect to the European mainland, which is the heart of modern Norway.

A third historic town, that of Bergen, is not on a fiord, but lies between the Sogne and Hardanger fiords. Once an important Hanseatic centre, it is to-day the chief port of Norway on the west, and is linked to Oslo by a difficult railway route over the plateau.

The Arctic archipelago of Spitsbergen (Svalbard) belongs to Norway: considerable amounts of coal are produced.

The classical book on the British Isles is H. J. Mackinder's *Britain and the British Seas* (Oxford, 1902). Vol. I of the *Oxford Survey of the British Empire* (1914) should also be consulted. *Les Iles Britanniques*, by A. Demangeon, forming Vol. I of the *Géographie Universelle* (Paris, 1927), is interesting as giving a foreign point of view. *Great Britain* (Cambridge, 1928), a series of essays by twenty-six authors, edited by A. G. Ogilvie, gives a detailed regional study of the larger island. An interesting sketch of the historical geography of Britain will be found in W. R. Kermack's *Human Environment and Progress* (London and Edinburgh, 1927). See also L. Rodwell Jones, *North England* (London, 1921).

CHAPTER IV

NORTH CENTRAL EUROPE: BELGIUM AND THE NETHERLANDS—GERMANY

BELGIUM AND THE NETHERLANDS

HOLLAND, or the Netherlands, forms the western continental margin of the Central European or North German Plain, which is continued also into western and northern Belgium, a country of more complex structure though of slightly smaller size and with a much shorter coast-line. The two countries have in common advantages of position, enabling them to act as intermediaries between overseas lands and the interior of continental Europe, and the possibility of considerable production of food and raw material from their agricultural lands. Nevertheless there are marked contrasts between them. These are due mainly to the more varied rocks of Belgium, which give to it mineral wealth denied to Holland, thus promoting large-scale industry, and to the fact that while Holland holds the lower courses of the important navigable rivers Rhine and Maas (Meuse), Belgium has not even control over the whole of the estuarine portion of the Schelde. Holland is thus better fitted for transit trade than Belgium. Both countries have a very high density of population, greater in Belgium than in Holland because of the industries of the former.

Holland (Fig. 8) consists entirely of recent (post-Tertiary) beds, mainly the deltaic deposits of the Rhine, Maas and Schelde. The characters of the soils in particular localities depend upon the part played in their forma-

tion by such agents as the sea, the rivers, the wind and the earlier ice-sheet. Local density of population, apart from the great ports, is influenced by the possibility of reclaiming the fertile marine and alluvial clays, the wind-blown sands and the coarse glacial detritus being mostly unproductive.

NATURAL REGIONS OF BELGIUM. Belgium can be divided into three regions, on the basis both of structure and relief. To the south-east lies the Ardennes Upland, rising to heights of over 2,000 feet, a timber-yielding and sheep-rearing area in its upper sections, but producing minerals near its gently-sloping north-western margin. That margin is faulted against an area of undulating plain, floored by Tertiary rocks, and forming a continuation of the similar plain of northern France. Northwards and westwards this Tertiary Higher Plain is in its turn margined by the Lower (below 300 feet) post-Tertiary Plain, that is by the prolongation of the plain of Holland and Northern Germany. Behind the short and straight coast-line with its marginal dunes, parts of the surface are, as in Holland, below sea-level, but the depressed area is of much less extent.

Belgium includes parts of two distinct river systems (Fig. 9). The Lys and the Escaut (the Schelde head-stream) enter from France, and, after their union at Ghent, receive a number of smaller streams from the plains before passing Antwerp to enter the deltaic region in Holland. A low ridge separates the Schelde waters from the Meuse system, the Sambre being the most important tributary of the latter in Belgium. The Sambre rises in France, its valley-line being a continuation of that of the Oise, and flows along the margin of the Upland. The Meuse, after cutting through the western part of the Upland, receives the Sambre at Namur, and then swings round at a sharp angle to follow the same valley-line to Liège, where it bends to the north and enters Holland near Maastricht.



FIG. 8.—GEOLOGY AND SOILS OF BELGIUM AND HOLLAND.

1. Coastal sand-dunes ; 2. Sandy beds of interior, including the Campine ; 3. Marine and river clays ; 4. The High Fens ; 5. The Tertiary beds of the Plain of Flanders and the corresponding area in the Paris Basin.
- A. The ancient folded rocks of the Ardennes Upland ; B. The chalk and other secondary rocks of the Ardennes, Champagne, etc. ; C. The Franco-Belgian coalfield, a part of the Ruhr coalfield is shown to the north-east.

The chief towns are indicated by dots and initial letters (see Fig. 9).

The curious pocket-like southern bend made by the frontier of Holland here should be noted.

It is difficult to exaggerate the importance of this Sambre-Meuse valley-line, and of the fertile Tertiary plain which lies parallel to it. From Cologne a natural route leads round the edge of the Upland past Aachen (Aix-la-Chapelle) to Liège, in the Meuse valley. From this point France can be reached by either of two routes. One leads by Namur to the Sambre valley and so past the French fortress of Maubeuge. Again, the Meuse can be followed south from Namur and so leads into France past the great battlefield of Sedan. From the river-crossings either at Maastricht or at Liège, again, routes lead through central Belgium to the sea. From the dawn of history down to the great European war the valley highways and the plain have been trodden by successive hosts of invaders, and some of the great battles of the world's history have been fought here.

The significance of the area has been increased by the local resources, which make it a desirable possession in itself as well as a potential line of invasion. The loess soils which support the rich wheat-fields of Picardy are continued into Belgium, extending from Tournai past Liège and into the Maastricht "pocket" of Holland, forming a wide productive belt. From Aachen along the Sambre-Meuse line also there stretches a coalfield which extends into northern France (p. 28), coal in Belgium being worked in deep mines, especially at Mons and Charleroi, as well as between Namur and Liège. Zinc and lead are obtained near Verviers. All this area is highly industrialised, Liège being particularly noted for its iron industry. A line running due west from the north of this town to the French frontier marks the division between the French-speaking Walloons of the south-east and the Flemings of the north and north-west, and the relations between industrial Belgium and the coalfield area of northern France are very close.



FIG. 9.—THE CHIEF TOWNS OF BELGIUM AND HOLLAND, AND OF THE CONTIGUOUS PARTS OF FRANCE AND GERMANY.

The Grand Duchy of Luxemburg, wedged in between south-eastern Belgium, Germany and France, is omitted.

The third zone, the low plain, generally resembles Holland both in its characters and in its problems. The coastal sand-dunes are less developed than in Holland, and the marshy strip behind them which, by the help of dykes, can be reclaimed for agriculture is less extensive. Further inland most of Flanders has a sandy surface soil, but this overlies clay which can be reached by deep ploughing, and the mixture of the two (loam) is very fertile. Centuries of effort have, therefore, made much of the plain highly productive. To the north-east, however, the sandy deposit becomes much thicker, sand-dunes occur, and we have the great barren tract called the Campine, which extends over the frontier into Holland. Recently this area has acquired new importance with the discovery of coal, worked on a small scale in Dutch Limburg, and on a greater in Belgium.

The reclaimed marshes and the loam of Flanders furnish both pasture and arable land, the soil and climate favouring flax cultivation, and the waters of the Lys being peculiarly suitable for retting. Manufactures were thus of early origin; Bruges, Ghent and Ypres have long been woollen towns, while Ghent, Tournai and Courtrai make linen. The working of the coal of the south-east has given new importance to textile manufactures generally.

The whole of the region is intersected by waterways which connect with those of France and also with the Sambre and Meuse. Antwerp has also water connection with the Lower Rhine through the channels of the delta area. But it has proved very difficult to maintain convenient direct waterways from such towns as Ghent, Bruges and Ypres to the sea, and except for the packet station of Ostend, and the newer port of Zeebrugge, sea traffic is concentrated on Antwerp, which has the great advantage of being linked to almost all parts of the country by waterways, and has easy direct railway communication with Westphalia (the Ruhr

region). Brussels, the capital, on a tributary of the Schelde, almost halfway between Bruges and Liège, and between Antwerp and Mons, is, as one would expect from its position, an important railway centre. Its inhabitants speak French, though it is within the Flemish area. It is much the largest town, with a population, including the suburbs, of about 800,000, slightly exceeding that of Amsterdam, the chief town of Holland. Antwerp, on the other hand (about 300,000), is smaller than Rotterdam (about 500,000). The fact that Holland thus includes two large ports as compared with one in Belgium is a result both of Holland's advantage in controlling the mouths of the Rhine, and of the greater value of the trade with the Dutch colonies, particularly the East Indies, as compared with that with the Belgian Congo. But the extensive colonial possessions of Holland are themselves a heritage from the period when the Dutch took advantage of their position on the Rhine to act as intermediaries between the Far Eastern lands and the heart of Europe, so that Holland's wider trade relations depend essentially on geographical position.

THE PLAIN IN HOLLAND. In the Netherlands the coastal sand-dunes fringe the numerous separate islands of Zeeland, and from the Hook to Helder form a continuous and high barrier protecting the low-lying lands behind, which constitute Holland in the limited sense. Northwards the barrier has been breached by the sea in historic times, so that the Frisian islands, like a broken dam, margin the flooded area now forming the shallow Zuider Zee, and are continued eastwards towards the similar but smaller flooded area of the Dollart. Behind the dune belt lies a wide tract of marine clay, which, in the provinces of North and South Holland, is intersected by bands of river clay along the streams, and by larger areas of Low Fen, that is of marsh where many generations of swamp plants have grown and rotted. These low-lying areas form the Dutch polders, or dyked and reclaimed

lands, which are the basis of the country's agricultural prosperity. The inner side of the dunes, with supplies of fresh water from the sands, and the possibility of mingling different types of soils, forms a favourite site for towns. Note particularly The Hague, the seat of the Court and Legislature, Leiden and Haarlem, the last noted especially for its bulbs and market-gardening.

Except that the fertile river clays are continued eastwards along the courses of the rivers, particularly between the Lek and the Waal (the Betuwe, or "good land"), the rest of Holland is mainly barren. We have already spoken of the Campine (called Kempen in the Netherlands). The same sandy type of surface appears in the Veluwe, or "bad land," to the south of the Zuider Zee, and is continued eastward, beyond the narrow strip of river clay which fringes the Yssel or Ijssel, passing northwards into the Bourtanger Moor on the left bank of the Ems, where a covering of moor plants appears in places, giving rise to the High Fens. It is this limited amount of fertile land which has led to the great scheme, now in progress (Fig. 10), of reclaiming large tracts of the Zuider Zee by means of a dyke from the coast of North Holland to the island of Wieringen, continued to the coast of Friesland.

Manufactures are mainly concerned with the working up of local agricultural produce (note cheese-making, brewing, woollen and linen manufactures, china), or of imported colonial produce (cocoa, tobacco, diamond-polishing at Amsterdam, sugar-refining, etc.), coal being easily obtained from Germany or England.

Rotterdam on the Lek, with its outport of the Hook, is the great Rhine port; Flushing, on one of the Zeeland islands, is a passenger port competing with Ostend. Amsterdam was formerly unfavourably situated as a modern port on account of the shallowness of the Zuider Zee, but its two great canals, the longer North Holland canal to Helder and the shorter and deeper North

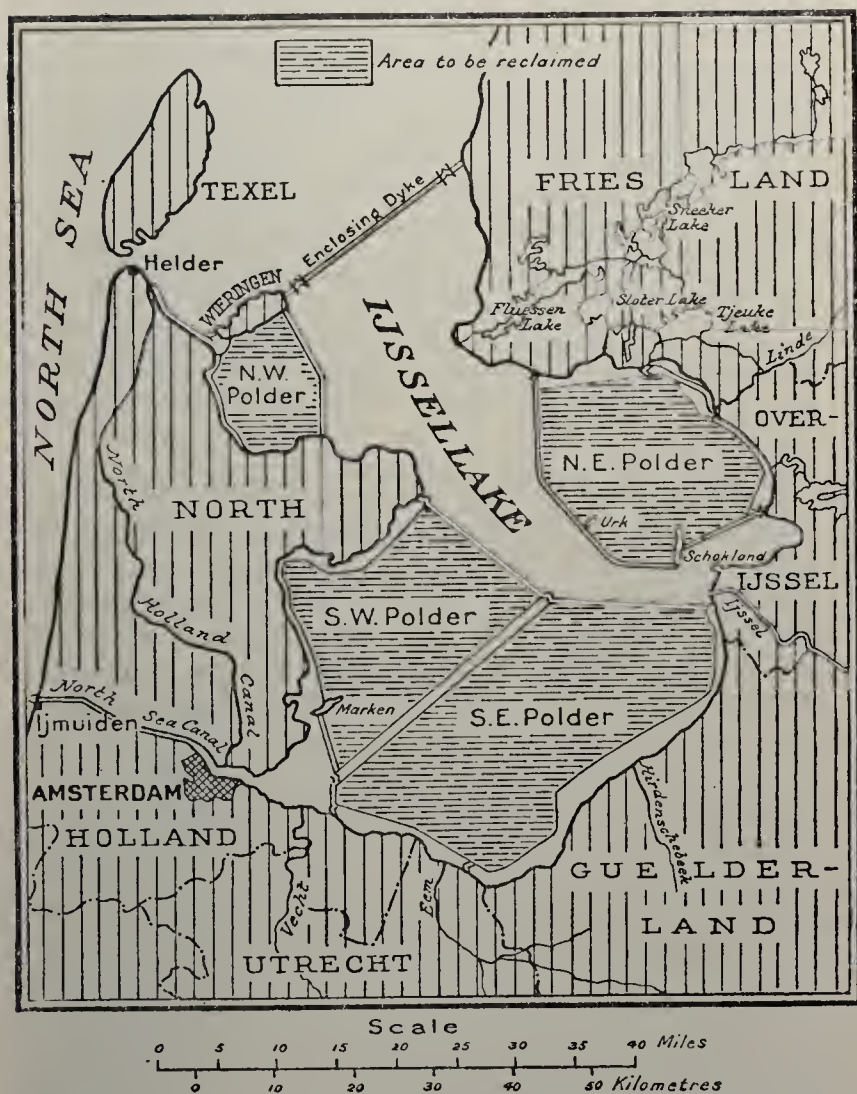


FIG. 10.—SCHEME FOR RECLAIMING THE ZUIDER ZEE BY FORMING SUCCESSIVELY A SERIES OF POLDERS, LEAVING ONLY A COMPARATIVELY SMALL LAKE IN THE CENTRE.

Sea canal to IJmuiden, have greatly increased its trade.

The Grand Duchy of Luxemburg is a small state within the Ardennes Upland, chiefly important because of its resources of iron ore, and now within the Belgium Customs Union (note the large Belgian iron industry).

Belgium has an area of about $11\frac{1}{2}$ thousand square miles and a population of nearly eight millions. It has a very high density of population, about 670 per square mile, a figure almost identical with that for England and Wales. The Netherlands have an area of about $12\frac{1}{2}$ thousand square miles, and a population of about $7\frac{1}{2}$ millions. Though the density (about 600 per square mile) is less than that of Belgium, it is more than three times as great as that of France (192), and more than two and a half times that of Denmark (207), a country with which Holland is often compared.

GERMANY (DEUTSCHES REICH OR GERMAN REALM)

Before the war the German Empire and France were approximately the same size, but the former contained about 65 million people as against 40 million in France. Owing to loss of territory, particularly to France and to Poland, the present German Republic has a considerably smaller area (about 181,000 square miles), with a population at the census of 1925 of under $62\frac{1}{2}$ millions. So far as density of population is concerned Germany thus occupies an intermediate position between England and Belgium on the one hand, and France on the other. But the distribution is very uneven, areas of very high density (Saxony, 863 to the square mile) alternating with others of low (Mecklenburg, 127 to the square mile).

Such facts at once suggest great diversity of surface and resources, and when we note that in the two examples given Mecklenburg lies on the Baltic coast in the plain, and Saxony on the margin of the mineralised uplands, we are tempted to conclude that the plain is poor and thinly peopled. But we find that the capital, Berlin, now the largest city of continental Europe, lies in the heart of the lowlands, in a region which shares all the disadvant-

ages of the coastal strip—a harsh climate, soils not naturally fertile, absence of mineral wealth, including coal—and adds to them a situation relatively remote from the sea. Further, Berlin is, despite its distance from coal, essentially a product of the late industrial period. In the middle of the 17th century, when Paris and London were already great, even by modern standards, and had a long tradition behind them, Berlin only contained some 6,000 people. Even in the middle of the 19th century Berlin had not reached half the size of Paris, and its population was considerably less than half a million. Clearly then it is not, as Paris and London are, a natural route centre, and the causes of its rise must be complex. Further, the present-day frontiers of Germany date only from the post-war settlement, and the changes which that settlement made were extensive. Such a state is ill-adapted to a division into natural regions, which imply that some sort of adjustment has been reached between man and his surroundings. In this case we shall have to take more account of historical events than has been necessary in the countries already studied.

STRUCTURE AND RELIEF. Of the three structural elements—plain, upland, mountain—represented in Germany, the mountain one is insignificant, being limited to a narrow strip of the northern Alps on the Bavarian frontier, between the eastern end of Lake Constance and the Austrian frontier town of Salzburg. Broadly, the country may be said to be made up of parts of the North German Plain and of the Central Uplands of Europe.

The Uplands (Fig. 12) are complex, but one series of them forms a rampart-like belt of high ground extending from west to east in about latitude 50° – 51° , broken only by often narrow river valleys. In the west we have the Rhine Schist Highlands, north of the river Main. The Rhine cuts through these in its gorge between Bingen and Bonn, and, together with its left bank tributary the

Moselle and its right bank one of the Lahn, cuts the upland into four blocks, the Hunsrück and Eifel to the west and the Taunus and Westerwald to the east. The latter are continued into the hill country of Hesse, again linked to the uplands of Thuringia and Franconia, and to the Ore Mountains and the Sudetes.

One would expect that such an upland belt would become a frontier, and the Ore Mountains and Sudetes do form a boundary with Czechoslovakia, despite the fact that the Elbe breaks through between them to enter upon its plain course. In the west, however, states included in the German federation transgress the central upland wall, and extend south of the Danube to the Upper Rhine and the Alpine margin. Thus to the south-west we have a projecting block of German territory, mainly upland, but including a considerable tract of lowland in the Rhine valley upstream from the Rhine Gorge. This tract balances, as it were, the similar non-German block of the Bohemian Diamond further east. It is drained mainly by the Rhine and its tributaries, of which the Main and the Neckar should be noted, just as the Diamond is drained by the Elbe; but part of its southern section is crossed by the Danube, which merely skirts the Diamond.

Owing to the arrangement of the Central Uplands the North German Plain is narrow in the west and widens eastwards, where in the Oder Valley it practically reaches the southern frontier. Though its surface rarely exceeds 600 feet, it is not uniform. The generally infertile glacial deposits spread over its surface by ice advancing across the Baltic during the Ice Age form three series of roughly semi-circular ridges. The first is coastal. More distinct is the series forming the Baltic Heights, whose lake-sprinkled surface extends from the base of the Danish peninsula to the Vistula and beyond, and reaches a maximum height of over 1,000 feet west of the town of Danzig. Finally, the Southern Heights begin in the Lüneburger Heide, between the Elbe and the Weser, and

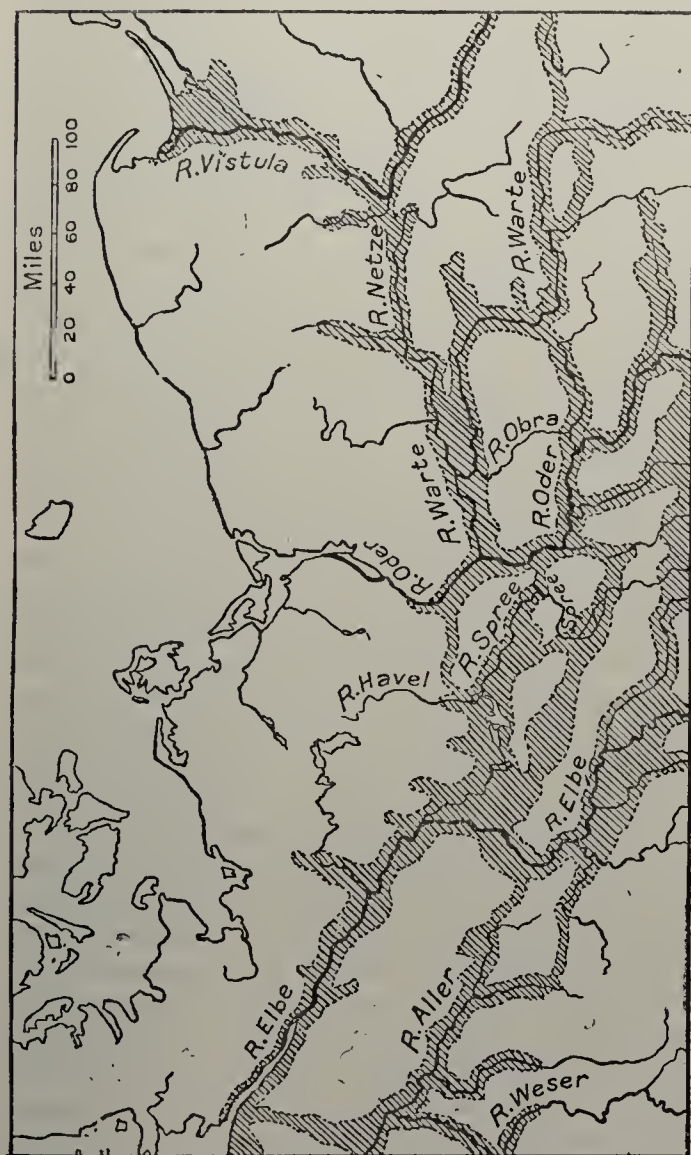


FIG. 11.—THE ANCIENT VALLEYS AND THE RIVER SYSTEMS OF THE NORTH GERMAN PLAIN.

The stippled areas show the ancient valleys.

sweep round into Poland. More important than these ridges, which are hardly discernible on atlas maps, are the generally concentric depressions, or ancient valleys, which have had much historical importance.

These depressions are partly occupied by the existing rivers, and it is owing to their presence that the rivers of the plain present such anomalous features; in part, however, they are devoid of running water, and till the construction of canals within them were swampy and covered with brushwood. The more important are shown on Fig. 11, and we should note first that they are widest and most branched in the region round Berlin, and second that they have a general east to west trend, and are thus sometimes crossed almost transversely by the great rivers which drain from the Central Uplands to the sea. The tributaries of the rivers, on the other hand, not infrequently run along them from east to west.

Two specific examples may be taken. The Elbe, from Magdeburg to its junction with the Havel, runs from south to north, while the Havel in its middle course, flows westward. But the ancient valley in which the Havel is flowing is continued eastwards to the great westward bend of the Oder, the intervening section being now occupied by the Finnow canal. The same ancient valley is continued eastward along the Warte, a tributary of the Oder, and along its feeder the Netze, which points, as it were, to the westward bend of the Vistula near the town of Bromberg. Here again there was once an empty, swampy depression, now occupied by the Bromberg canal. Another ancient valley can similarly be followed from the Elbe by the Havel and Spree to the Oder and the Warte and is continued to the Vistula downstream from Warsaw. It is the existence of these and other ancient valleys which has made it possible to link the rivers Weser, Elbe, Oder and Vistula in their plain courses by canals, and so facilitate greatly communication across the plain.

As to the origin of these ancient valleys, it may be noted that some geographers believe that they are the result of glaciation. The three semi-circles of morainic heights are supposed to mark successive stages in the retreat of the ice, which formed a cake-like mass on the surface of the plain. It is suggested that the meltwater, finding no direct exit to the sea, was obliged to creep round the edge of the ice, and so etched out the valleys. Other geographers believe that this is too simple an explanation, and that the valleys are the remains of a pre-glacial drainage system carved out on the surface of the old rocks which now lie deeply buried beneath the morainic material.

THE GERMAN STATES. Since 1918 Germany has been a federal republic composed of eighteen states, reduced to seventeen in 1929, as the result of the absorption of Waldeck by Prussia. Of these states by far the largest and most populous is Prussia. Prussia sprawls across the plain from the extreme west to the extreme east, where a portion (East Prussia) is now separated from the rest by Poland and the Free City of Danzig. It includes also the Rhine Schist Highlands and other smaller parts of the Central Uplands. Bavaria, the next largest state, extends from the Thuringian plateau to the Alps, and is bisected by the Danube. It is only about one quarter of the size of Prussia, and has a considerably lower density of population. No other state attains even one-tenth of the size of Prussia and several have areas comparable to those of the smaller English counties.

The present states are the survivors of a much larger number, many having been absorbed, particularly by Prussia, the predominating partner. It was the King of Prussia also who became German Emperor in 1871, when the German states, which then numbered twenty-six, were confederated to form the Empire. In a sense we may say that modern Germany is an enlarged Prussia, and the causes which have led to the growth of Prussia are thus important. Some of those causes were historical, but geography has exerted much influence.

THE ORIGIN OF PRUSSIA. The kernel round which the state of Prussia grew was Brandenburg, the region in the

heart of the plain where the Elbe and the Oder bend towards one another, and for the origin of Brandenburg we have to go far back in history.

In the early centuries of our era the Germanic peoples seem to have occupied a solid block of territory extending from the Rhine to the Vistula, and from the Danube to the shores of the North and Baltic Seas. Later the Slavs advanced westwards across the plain, and by about 600 A.D. the Germans had been pushed back to the Elbe-Saale line. The Saale is a left bank tributary of the Elbe, which joins it upstream from the town of Magdeburg, and has the same south-to-north direction as the section of the Elbe from Magdeburg to the Elbe-Havel confluence. By the beginning of the 10th century the Germans had established a frontier province, or march (Mark), behind the Elbe here, with the fort of Magdeburg, ensconced at a bend of the river, as its centre. This, the Altmark, or old march, was the beginning of Brandenburg, and served as a starting-point of the German effort to recolonise the ground lost.

The recolonising process meant the substitution of the German language and culture for the Slav, and in part it involved a blending of Germans and Slavs to produce a mixed stock. More or less pure Slav stocks, however, tended to persist as cultivating peasants dominated by German overlords. Eastern Germany shows still a certain distinction of breed or racial stock between landowner and peasant. This is characteristic of Eastern Europe generally, while in Western Europe peasants in this sense do not now exist, so that in this as in some other respects Germany is a transitional state between east and west.

We have to note next that German recolonisation took place in stages ; that Prussia was the main agent by which it was effected ; and that it was never complete. The early stages were the advance from the Altmark across the Elbe into the region between that river and the Oder,

with the foundation of the Mittelmark, or middle march, and then across the Oder into the Neumark, or new march. The Order of the Teutonic Knights undertook an independent crusade on the shores of the Baltic round the river Pregel, where their fort of Königsberg was built in 1255. This eastern colony became the Duchy of Prussia, and after its absorption by Brandenburg it gave its name to the state of Prussia. That state grew steadily through the centuries, spreading both east and west by conquest and absorption. It was necessarily organised on a military basis, and its military power was used both to extend German influence in the east, and to absorb areas in the west already German.

In two separate regions the geographical conditions enabled the Slavs to maintain their language and culture as against the German advance. One region lies behind the barrier of the Ore Mountains and Sudetes. Within the Bohemian Diamond, that is, the Slavs whom we call the Czechs found a refuge from the Germans of the plain. The Germanic stock, it is true, had always persisted in the upland region watered by the Upper Danube, but those Germans who became the Austrians were unable to penetrate the heart of the Diamond from the south because of its other bounding hills, the Bohemian Forest and the Moravian Heights. The reason for the persistence of the second Slav group, the Poles, depends on more subtle geographical detail.

An atlas map indicates that the frontier of post-war Poland shows a westward bulge in the region of the Warta and its feeders, the Netze and the Obra. The two latter, indeed, for small portions of their course form boundaries. We have already spoken of the wide ancient valley (Fig. 11) which extends from the Oder to the Vistula by way of the Warta and Netze. Before it was drained this depression formed at once an obstacle to free movement and a convenient ditch of defence. In a quite general sense it still marks the limit between the

area to the north-west where the population is German-speaking and that to the south-east where it is mainly Polish-speaking. The Germans were able to push up the main Oder valley, but the Poles formed an almost solid block round the Vistula south of the Netze-Bromberg line, while along the lower course of the Vistula the two peoples were mingled, owing to the German advance along the coast, and a Polish one down the river.

TRADE AND CENTRES OF POPULATION IN MEDIAEVAL GERMANY. German recolonisation of the plain involved continuous struggle, and for this there were three main geographical reasons. In the first place it was difficult to find satisfactory permanent, as distinct from temporary, frontiers. In particular the fact that the advance was easy along the Baltic coast and difficult in the centre raised a serious problem for Prussia, with its inherited fear of the Slavs. Again, the plain seemed to extend endlessly eastward, and as was shown time and again its far eastern section formed a reservoir of migratory peoples, always tending to overflow. Finally, throughout its extension the plain does not show any such notable change in relief and climate as to lead to great differences in products. There was thus little to stimulate transverse trade, and even if there had been the ancient valleys, till they were drained, made communication difficult. In Eastern Germany then, right down through the Middle Ages and beyond, the land remained the main source of wealth, and no powerful trading class arose to diminish the contrast between noble and peasant.

In western Germany conditions were quite different. The Alps constitute a climatic divide separating areas of quite different products, which could communicate across the passes. The Baltic Lands yielded furs and amber, while herrings were formerly abundant in the Baltic Sea, and parts of the western plain contained deposits of salt for use as a preservative. The Mediterranean Lands had not only valuable products of their

own, but through Venice and Constantinople they had access to the spices, silks, fine muslins and other treasures of the Far East. Thus during the centuries when Prussia was acting as guardian of the gate, groups of towns in the west were growing rich from the proceeds of trans-alpine trade.

The map (Fig. 12) indicates the position of some of these towns. In the south we note Ulm, at the head of navigation on the Danube; Regensburg (Ratisbon) at the head of the great northward bend of the river, and near the entrance of the Naab tributary; Augsburg, on the Lech, a right bank tributary; Nürnberg, on a feeder of the Main, a right bank tributary of the Rhine. Nearly due south of Munich, a more modern town than those just named, lies the low Brenner pass (Fig. 15) across the Alps. The Brenner connects the Isarco, a tributary of the Adige, with the Middle Inn valley. The Adige leads to the North Italian Plain and so to Venice, while from the Middle Inn valley it is possible to reach the Danube over the Seefeld pass. These facts enable us to trace easily the reasons for the importance of the four towns named at the time when trade goods came by pack horse over the Alps. From the Brenner Augsburg could be reached over the Seefeld. Its river, the Lech, led to the Danube. If the Danube was followed upstream Ulm was reached, whence routes led to the Rhine either by the Neckar or by south-western routes, which also gave a connection with the important St. Gothard route across the Alps. Regensburg, again, could be reached by following the Danube downstream from the entrance of the Lech. From it routes led northward to the Elbe via the Naab valley, or westwards to the Rhine by Nürnberg and Frankfurt.

So far as the distribution of the goods was concerned the great navigable rivers of the plain, together with the Baltic and North Seas, were very important, and the Hanseatic League was the active agent. Its central

seaport was Lübeck, on the Baltic, at the mouth of the insignificant Trave river, but its influence extended up the great rivers to Cologne on the Rhine, Magdeburg on the Elbe, Frankfurt on the Oder and Thorn on the Vistula.

Lübeck was well placed to command the traffic of the Baltic, where the amber of the Kurisches Haff and the Frisches Haff was important. So early as the end of the 14th century it was connected to the Elbe by a canal, and so tapped the traffic of that river. A land route led also from Lübeck round the margin of the uplands to Frankfurt on the Main, the great exchange centre.

THE RISE OF MODERN GERMANY. This state of affairs was bound to undergo a change when the advance of the Turks and the discovery of the new way to India led to a shift of the trade routes from the Mediterranean Sea to the outer ocean. But the special feature so far as Germany is concerned is that there was no gradual, continuous change, but a hiatus, a sharp break in historical development. During the Thirty Years' War (1618-48) the German states were involved in almost continuous fighting, which reduced the population greatly and led to general impoverishment. Recovery was slow; new developments hardly began before the end of the 18th century, and were not rapid till after the Franco-Prussian war in 1870-71. Not only then did the German states almost cease to count during the critical period of the 17th century, when England was laying the foundations of her colonial empire, but they remained relatively poor and backward even in the late 18th and early 19th century, when large-scale industry was beginning to develop in England.

Between 1871 and 1914, however, German development was extremely rapid, and owing both to the late start and to the geographical features of the country followed somewhat different lines from that of Great Britain. The utilisation of coal as a source of power in large-scale

industry took place in both countries, and Germany is in Europe only second to Great Britain as a coal-producing country. It stands third among the states of the world, the United States having now the largest output. In Germany coal occurs especially on the margins of the



FIG. 12.—TOWNS AND ROUTE-LINES IN NORTH-CENTRAL EUROPE.

The Northern Alps, with their continuation in the Carpathians, are shown by vertical shading, the Central Uplands by oblique shading. The figure should be compared with Fig. 15, and the individual Uplands named from an atlas map.

Central Uplands, particularly in Westphalia (the Ruhr field), Saxony (near Chemnitz and at Zwickau), in the Saar region (meantime in French occupation), and in Silesia, where, however, the Upper Silesian field has now been mainly transferred to Poland. Between 1871 and

1918 the main source of iron ore was the Lorraine region annexed from France (p. 32), but the fact that the chief iron industry is carried on on the Ruhr coalfield means that Spanish and Swedish ores can be easily imported by the Rhine.

A great apparent disadvantage is the small North Sea seaboard, and thus the limited access to ocean routes, with the fact that Germany as a late-comer found it difficult to obtain colonial territories to supply the tropical and sub-tropical produce so necessary in modern industry. As against this, however, the German Empire included large contiguous tracts in the eastern part of the plain, already organised on an agricultural basis, and capable of supplying much of the food required for the growing industrial population. The output of these lands was greatly increased by improved methods, particularly by the use of artificial fertilisers. In this connection the deposits of potash salts, mined at Stassfurt, in Prussian Saxony, are of great importance. As contrasted with England, therefore, in Germany agricultural and industrial developments have gone hand in hand, and German dependence on imported food is still proportionately less than English.

Since industry developed mainly in the west, particularly in the Rhine lands and in Saxony, while the east remained agricultural, there was now a possibility of exchange between the two parts of the country. This new need led to the great development of artificial waterways within the plain, and increased the importance of Berlin, their natural centre. Even more important was the fact that the plain proved admirably fitted for the construction of railways, Berlin being again the natural centre. It took over, therefore, much of the former importance of Frankfurt as the great exchange mart of Central Europe, just as the North Sea port of Hamburg took over the part formerly played by the Hanscatic town of Lübeck. The construction of the Kiel Canal,

completed in 1895, put the Elbe estuary in direct communication with the Baltic. With the shift of trade routes the towns in the region of the Upper Danube necessarily lost importance, while those on or near the Rhine and in Saxony gained. Prussia, with its great centre at Berlin, dominated more and more, but failed to adapt its political methods to modern conditions, and the great catastrophe of the war resulted, and led to the loss of many of Germany's earlier gains, including all the colonial territories.

As regards industries, Essen, in the Ruhr region, is the great seat of iron manufacture. The textile industry is very important, being carried on both in the Rhine industrial region and in Saxony. In the former Barmen and Elberfeld manufacture woollen and silk goods, and Crefeld makes silks and velvets. In Saxony Chemnitz is the great cotton centre. A peculiarly German set of industries is connected with the making of chemical and electrical apparatus, the former including dye-stuffs of which Germany used to have a practical monopoly. Ludwigshafen, opposite Mannheim on the Rhine, is the main seat of the chemical industry, while Berlin and Nürnberg manufacture electrical plant.

Germany has a total area of about 181,000 square miles, of which total 112,600 square miles fall into Prussia. Of the total population of nearly 62½ millions, 38 millions live in Prussia. Bavaria, the next largest state, has an area of about 29,000 square miles and a population of over seven millions. Seven towns have a population exceeding half a million, these being Berlin (four millions), Hamburg (over one million), Cologne, Munich, Leipzig, Dresden and Breslau. The largest item in the list of imports is raw material and semi-manufactured articles but there is a considerable import of grain. The main exports are manufactured goods.

In following the development of Germany an historical atlas is necessary. Shepherd's *Historical Atlas* (London, second edition, 1922), and *Philips' Historical Atlas*, by Ramsay Muir and George Philip (London, sixth edition, with text, 1927), may be mentioned.

CHAPTER V

NORTH CENTRAL EUROPE : DENMARK— SWEDEN—POLAND

DENMARK

THE PLAIN IN DENMARK. The North German Plain, with its thick mantle of glacial deposits, is prolonged northwards across the entrance to the Baltic Sea. As contrasted with the continuous mainland section this prolongation is divided into a western peninsula, of which a part only is included in the kingdom of Denmark, and an eastern archipelago, penetrated by three sea-channels. The whole resembles generally the rest of the plain, and though a strip on the eastern side of the peninsula, together with the islands, contains fertile, loamy soils, the local resources are small. The position, however, gives the area considerable strategic and economic importance and that for a twofold reason. The three channels form the only natural (as distinct from artificial, e.g. the Kiel Canal) waterways from the North Sea to the Baltic. Again, the lie of the island belt in relation both to the peninsula and to the southward prolongation of Sweden, enables it to act as a bridge between central Europe on the one hand and northern Europe on the other. Historically, the bridge function is emphasised by the fact that parts of southern Sweden were attached to Denmark till the 17th century, and that Norway was not separated till 1814. Again, the present great importance of Copenhagen as a Baltic trade centre indicates the value of the control of the exit from that sea.

Widest in the north (Jutland), the peninsula narrows southward (Schleswig). While to the north the population is solidly Danish, and to the south solidly German, there is an intermediate belt where the stocks are mingled. Part of northern Schleswig (Danish, Slesvig) was transferred to Denmark after the war. This gives still another example of the difficulty of finding permanent frontiers in the plain.

The outstanding feature of the peninsula is that its western part is largely barren, and that the North Sea coast is dangerous and has few harbours. The small port of Esbjerg carries on some trade with England, but historically the peninsula has always looked east and not west, and the trade with England is a product of the industrial period.

The islands fall into two groups, a western and an eastern. Fyn, with some smaller islands, is separated from the peninsula by the Little Belt, and from the island of Seeland, with Laaland, Falster and the smaller island of Möen to the south, by the Great Belt. The Sound, on which Copenhagen is placed, separates the large island of Seeland from southern Sweden. It is narrowest (three miles) at its north end, where Helsingör (Elsinore) stands opposite the Swedish port of Hälsingborg. It was at Elsinore that the Danish tolls were formerly collected, but the town is now unimportant, the main traffic line being from Copenhagen to the Swedish port of Malmö (by train ferry). Malmö has direct railway connection to Stockholm, as has Copenhagen to Hamburg, by train ferries across the Belts. From Hamburg trains run to the Hook of Holland for Harwich, and also to Berlin. Copenhagen is thus a centre from which both Swedish and Danish goods can be sent to Germany and to England.

The modern prosperity of Denmark comes from the great development of the dairying industry, with butter, cheese, eggs and bacon as direct and indirect products.

But though technical education, government assistance and the use of co-operative methods have increased greatly the quantity and quality of the products, the very large population of Copenhagen, in relation to the total for the country, shows how much depends upon its importance as a collecting and distributing centre for Baltic trade. Like Rotterdam, in Holland, it has much more than purely local significance.

Denmark has now a total area of about 16,500 square miles, and is thus one-quarter larger than Holland. It has a total population of $3\frac{1}{2}$ millions, less than half that of Holland. Of this total three-quarters of a million, or about 21 per cent., lives in Copenhagen and its suburbs. The main exports are agricultural produce and the main imports manufactured goods, but Copenhagen makes gloves, and has some other industries.

Of Denmark's former large possessions only Iceland, Greenland and the Faeroes remain, and Iceland is now attached only through the person of the sovereign. It is not without interest to note the contrast between the Arctic and sub-Arctic possessions of Denmark and the tropical ones of Holland. Though Iceland is nearly two and a half times the size of the homeland it has little economic importance. To the physical geographer, however, it is of great interest owing to the fact that extensive glaciers and active volcanoes co-exist.

SWEDEN

STRUCTURE OF SWEDEN. The inclusion of Sweden among the states of Central Europe, with its consequent separation alike from Norway and from Finland, seems at first sight difficult to justify. Structurally it is formed mainly by a very old crust-block, the Baltic Shield (Fig. 1, p. 7), which is continued into Finland and the Kola peninsula. The central part of this resistant crust-block is sunk beneath the waters of the Gulf of Bothnia, but the original continuity is indicated by the Åland Islands, which form a broken bridge between its Swedish and Finnish sections. Eastward the limits

of the block are shown by the depression which extends from the White Sea to the Gulf of Finland, and bears the large lakes of Onega and Ladoga on its surface ; beyond this limiting hollow lies the Russian Platform (Fig. 17 p. 119). On the north-west the Shield abuts upon the ancient worn-down fold-mountains which constitute the greater part of Norway, and are themselves a continuation of the similar ancient fold-mountains of Highland Scotland. Thus the actual continuity of Norway and Sweden, and the similarity of structure of Sweden and Finland, seem to suggest that the three areas should be considered together.

On the other hand, in all that concerns the life of the people—their occupations, their social and political outlook, their trade relations—the essential Sweden, with its close connection with Germany through Denmark, with its traditional fear of that Russia which had its capital at Petrograd, belongs to Central Europe, rather than to the west like Norway, or to the transition belt between east and centre like Finland and the new Baltic states. To realise how this comes about we have to note the two great natural regions into which Sweden falls.

A line drawn from about Gävle on the Gulf of Bothnia to the Norwegian frontier on the Skagerrak divides Sweden into a northern and a southern region. In the southern one the surface rarely rises to 1,000 feet, and except for a central low plateau south of Lake Vetter, lies for the most part below 600 feet ; it is thus essentially lowland. Again, particularly in the wide lowland belt which stretches from sea to sea in the region of the great lakes, the old hard rocks of the Shield tend to be covered by recent deposits which make fertile soils capable of cultivation. In the extreme south, again, the secondary peninsula of Scania shares the structural characteristics of the Danish islands, and like them is covered by highly fertile loams. Here the beech occurs, as it does in Denmark, and with the oak forests of the lake belt it gives the

scenery a Central European aspect in striking contrast to the sombre pine and spruce forests of Norway and of northern Sweden.

North of the Skagerrak-Gävle line Sweden is mainly a plateau, rising in the interior to heights of over 3,000 feet, and with large tracts lying above 1,500 feet. Except along the lowland strip which borders the coast, also, the old rocks have often been scraped bare by the ice, and the soils are at best shallow and unproductive. As contrasted with the southern region, where mixed farming can be carried on—the crops in Seania including wheat and sugar beet—and dairying yields a surplus for export, the barren north must needs depend mainly on the less specialised occupations of lumbering and mining. These support a thinner and less concentrated population, so that the southern region has not only a greater density of population, but includes also all the important towns.

TOWNS AND RESOURCES. Of these towns the three largest, and the only ones with over 100,000 inhabitants, are Stockholm, Göteborg and Malmö. All are ports, Göteborg being the chief Swedish port, and the fact brings out another advantage of the southern region. It has a double coast-line, washed by water less subject to winter freezing than the Gulf of Bothnia. Stockholm, the capital, is not only centrally placed, but stands at the eastern end of the great midland depression. Göteborg, on the Göta river, which flows into the Kattegat, an arm of the North Sea, has access to all the ports of that sea, and trades largely with Great Britain, France and Germany. It is also connected by a continuous waterway through Lakes Vener and Vetter and the Göta canal to the Baltic coast, south of the port of Norrköping. We have already spoken of the position of Malmö (p. 87).

As emphasising the economic relations of the southern part of Sweden it is interesting also to note that Visby, on the large island of Gotland, was in earlier days a great

Hanseatic centre, and traded with Constantinople by way of the great Russian rivers. Visby is practically in the same latitude as Göteborg, the port through which Sweden now imports the tropical luxuries which once came to Visby. This is an interesting example of the effects of the shift of the trade routes since mediæval times (p. 92).

Apart from its dairy products, Sweden's chief resources are its forests and its mines, and these lie mainly in the northern region. Iron is the most important mineral, coal being absent save for very small deposits in Scania. The oldest iron mines are those at Dannemora, south of Gävle, and thus within the southern region as defined here. More important are the far northerly mines at Gellivara, in Swedish Lapland. The Swedish port for the product is Luleå, on the Gulf of Bothnia, but this is inaccessible in winter, and a railway connects the mines to the ice-free Norwegian port of Narvik. Other important iron mines lie at Grangesberg, south-west of Falun, and copper is mined at Falun. In connection both with mining and lumbering the ample resources of water-power are important, and Sweden "exports" hydro-electric power to Denmark by cables across the Sound.

Sweden has an area of 173,000 square miles, ten times as great as that of Denmark, but its population (6,000,000) is not twice as large. Stockholm, with under half a million people, is a smaller town than Copenhagen.

POLAND

COMPARISON BETWEEN POLAND AND GERMANY. So far as area and population are concerned the new Polish Republic ranks among the greater states of Europe. It is, however, made up of territories detached from the former Russian, German and Austrian Empires at the post-war settlement, so that adjustments are only in the act of taking place, and the part the country is destined to play as a political and economic unit is not yet clear. The constituent elements of the Polish Republic

are : Congress or Russian Poland, with the addition of part of the former Vilna territory ; Prussian Poland, with a part of Upper Silesia ; almost the whole of Galicia, which was formerly Austrian. In principle it thus includes the lands where Poles form a majority of the population, and is a Slav state. As compared with the great Slav state of Russia, however, the Poles are predominantly Catholics instead of belonging to the Orthodox church. They form an outpost of Catholicism between the Lutherans of the plain to the west and the Orthodox peoples of eastern Europe. In Poland, as in western Russia, there are many Jews, trade and finance being mainly in their hands.

So far as structure and relief are concerned, Poland is comparable to Germany, which it also resembles in its mineral wealth and the great development of the textile industry. In particular, Poland resembles Germany in that it includes a large stretch of the North German Plain ; it extends also to the Carpathians as western Germany extends to the Alps ; it has in Galicia an area of high plain comparable to that which constitutes so much of Bavaria and Württemberg. There are, however, two obvious differences from Germany. One is that while the latter country has a wide Baltic coast-line, and a North Sea one which, though short, contains important ports, Poland's coast-line is limited to a very short strip west of the Danzig Free State. In its difficult access to open water Poland resembles the eastern states of Europe generally. The other distinction is that the wall-like belt of central highland, so marked in Germany (p. 73), is not so easy to trace in Poland.

We described that highland belt as ending in the Sudetes, which overlook Upper Silesia, the region through which the Upper Oder flows. The centre of Upper Silesia is not, as it appears on an atlas map, true plain country, but rather a region of low hills. East of the river the land rises again, reaching in the Lysa Gora a height of

2,000 feet. This plateau is, as shown by its constituent rocks, really a part of the Central Uplands of Europe. Though lower and less continuous than the German highlands, it tends in a similar fashion to repel lines of communication, and separates lowland Poland, centring round Warsaw, from the high plain and the Carpathian slopes, with Craeow and Lemberg as centres. The two sections are linked by the Vistula and its tributary the San. The Upper Vistula flows broadly from west to east, skirting the southern edge of the upland, and then swings round it in a great curve, to flow generally northwards to Warsaw.

THE MORAVIAN GATE. The Vistula rises on the northern slopes of the western Carpathians, and its headstream before turning eastwards is not far distant from that of the Oder, which rises in the eastern Sudetes. The narrow gap between the two mountain groups is the Moravian Gate, one of the most notable features of this part of Europe. Its importance is twofold. In the first place it allows passage from the Oder valley, and so from the North German Plain, to the Mareh, and so to the Danube near Pressburg (Bratislava). Secondly, it gives a line of access from the Upper Vistula to the Oder and to the Danube. The Upper Vistula can be reached from the shores of the Black Sea by a route following the outer margin of the Carpathians. Thus the Moravian Gate lies at the junction of three routes (Fig. 13), two from the Black Sea, by the Danube main stream or by the outer Carpathian slopes, and one from the Baltic. Craeow, on the Upper Vistula, has thus an important strategic position, though it is some distance from the actual gap. The Moravian Gate should be compared with the Gate of Burgundy (p. 22) the gap between the Vosges and the Jura, as the former is that between the Sudetes and the Carpathians, and also with the Austrian Gate, upstream from Vienna, where the Danube breaks through between the Bohemian Diamond

to the north and the eastern Alps to the south. Vienna has always been the capital of Austria; Cracow was the capital of an earlier Poland, but has in the new Poland given place to Warsaw.

Upper Silesia has always been a bone of contention among the states in its vicinity. Part of the reason is found in its relation to the Moravian Gate; but it has also



FIG. 13.—UPPER SILESIA AND THE MORAVIAN GATE.

1. Coalfields; 2. The Carpathians; 3. The Sudetes.

much economic value. At the western edge of the Polish Upland, that is, to the east of the Upper Oder, very rich coalfields occur. The most productive lay formerly in German territory, where coal was worked at Königshütte, Gleiwitz, Beuthen, and other places. Less important were those included in Russian Poland, while a more isolated area occurs near Teschen, between the head-streams of the Vistula and the Oder, in what was formerly Austrian territory. In addition to coal, zinc, silver-lead and iron also occur. Practically the whole of this richly mineralised area has now passed to Poland. In addition

to this mineral wealth on the margin of the Upland, salt deposits occur near Cracow on the Galician high plain, and petroleum wells on the Carpathian foothills, southwest of Lemberg (Lwow).

One is tempted to think of Poland as mainly agricultural, and the areas which were formerly included in Prussia are very productive. Russian Poland, however, showed a remarkable development of industry, particularly the textile industry, Lodz (pronounced Wudsh) and Warsaw being the main centres. The textile industry was largely under German control, and its main advantage was the free access to the large Russian market. This has now been cut off, owing to the frontier changes.

Poland has an area of about 150,000 square miles, with a population of 27 millions, of whom 70 per cent. are Poles. Other nationalities represented include Ruthenians, Jews and Germans. Warsaw has a population of nearly one million, Lodz of nearly half a million. Other important towns are Lemberg, Posen (Poznan) and Cracow. Danzig is the port, but a harbour is being built at Gdynia, on the Polish coast proper.

For the boundaries of Poland and the other new states of post-war Europe, reference should be made to such books as Bowman, *The New World* (New York, 1921, fourth edition, 1928); Fleure, *The Treaty Settlement of Europe* (London, 1921); Newbiggin, *Aftermath* (Edinburgh, 1920). See also *Handbooks of the Historical Section Foreign Office* (London, 1920), especially Nos. 43, 44, 45, 46.

CHAPTER VI

SOUTH CENTRAL EUROPE : THE ALPINE-CARPATHIAN AND BALKAN STATES

SWITZERLAND

As Alpine-Carpathian states, we have included Switzerland, Austria, Czechoslovakia, Hungary and Roumania, because of their relation to the great chain of young fold-mountains known in different parts of its course as the Alps and the Carpathians. But though Switzerland and Austria resemble one another in being Alpine states, the former differs notably from the other four in one respect. Austria, Czechoslovakia, Hungary and Roumania, in their present boundaries, date only from the post-war period, being results of the break-up of the former Austro-Hungarian Monarchy. Switzerland, on the other hand, is one of the few continental states whose frontiers have remained unchanged since the close of the Napoleonic era.

Austria-Hungary was characterised both by the racial diversity of the included peoples, and by the antagonism between the racial elements. The basis of its subdivision was, at least in theory, racial, the idea being that the new states should be as far as possible racially homogeneous. It is, then, all the more remarkable to find that stable Switzerland is remarkably heterogeneous as regards its population. Not in racial origin, not in speech, not in religion do its inhabitants show unity, and only to a minor extent can it be said that the different cantons share common traditions. Three languages, French, German and Italian, are recognised officially, and

a small minority speaks the Romonsch dialect. The French-speaking Swiss live in the west and south-west, and form about 21 per cent. of the total population. In the canton Ticino, which extends over the southern slopes of the Alps, Italian is spoken, but only by about 6 per cent. of the total population. The Romonsch dialect is confined to the large eastern canton of Grisons, and the rest of Switzerland is inhabited by German-speaking people who form about 70 per cent. of the total. In religion about 57 per cent. are Protestants and 41 per cent. Catholics, but while there are cantons almost purely Catholic, like Ticino and Valais, and others like Zurich and Vaud mainly Protestant, there is no general correspondence between language and religion, save that the Italian-speaking people of Ticino are Catholics.

NATURAL REGIONS. Switzerland can be divided into three distinct Natural Regions, the Jura, the High Alps, and the intervening Midland, the home of most of the Swiss people.

The Midland Region lies at an average height of from 1,200 to 2,500 feet above sea-level, and has a very irregular surface, having been so moulded by ice and water action as to display no extensive level areas. Essentially the space between the steep south-eastern slopes of the Jura Mountains and the more gradual rise to the great heights of the Swiss Alps, it is narrowest to the south-west, where Alps and Jura converge, and wider to the north-east, where they stand well apart. If we disregard its south-western extension in the small canton of Geneva, compressed between the Alps of Savoy and the Jura Mountains, we may say that the Midland Region stretches from the north shore of Lake Geneva to the south shore of Lake Constance. It is drained, save for a small section sending water to Lake Geneva and thus to the Rhone, by the Aar, one of the great tributaries of the Rhine. For a considerable part of its course the Aar flows in a hollow at the base of the Jura, and the

hollow is continued to the south-west, where it is occupied by the large lake of Neuchâtel and the smaller one of Bienne. The presence of this hollow means that the limit between Jura and Midland is more sharply marked than that between Midland and High Alps; this has a considerable bearing on the sites of towns.

The Jura Mountains, which are built of limestone, do not rise much above 5,000 feet in height, but like many limestone tracts, form a considerable obstacle to communication, and make an effective boundary. They are relatively poor and thinly-peopled, but minor industries, e.g. watch-making (La Chaux-de-Fonds), are added to the natural resources of wood and pasture, and some cultivation is also carried on.

The Swiss High Alps rise to heights of over 14,000 feet, and are characterised by the large areas covered by permanent snow and the size and number of the glaciers; there are thus large reserves of water-power. Further, they form the focal point of the drainage system of Central Europe, water flowing to the North Sea (Rhine), to the Black Sea (Inn), to the Adriatic (Ticino), and to the western basin of the Mediterranean (Rhône); but the greater part of Switzerland is drained by the Rhine, both head-streams originating within the country. The Swiss High Alps are well wooded, but the local demand for timber as fuel and building material is too great to permit of export, and Switzerland is on balance a timber-importing country, obtaining even firewood from Yugoslavia. The Swiss Alps are poor in minerals, and their chief resource is found in the high pastures (alps) which form the basis of the stock-rearing industry (mainly cattle and goats), and thus of the export of cheese, condensed milk and milk chocolate. The magnificent scenery leads also to a large influx of visitors both in summer and winter, and this traffic is a considerable source of wealth. In the valleys, particularly those to the south, a certain amount of cultivation is carried on, including wheat and the

vine; but rye is the characteristic cereal of the higher areas.

COMMUNICATIONS AND TOWNS. The real significance of the Swiss High Alps, however, lies in the fact that

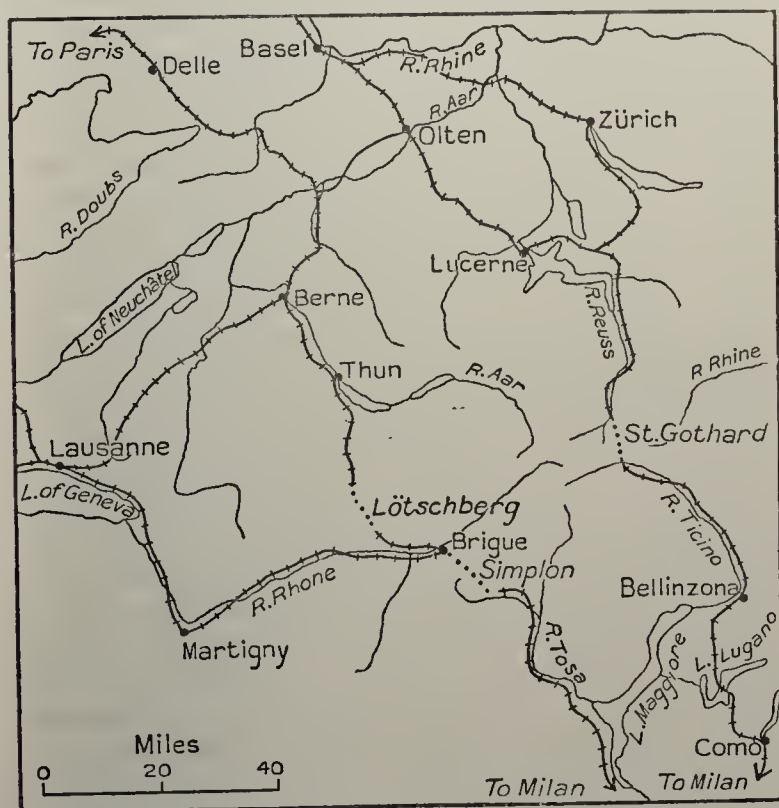


FIG. 14.—THE INTERNATIONAL RAILWAY ROUTES ACROSS THE SWISS ALPS.

they are so interpenetrated by the headstreams of the Rhine and by the Upper Rhone as to afford many lines of access to the Plain of Lombardy, and thus to the Mediterranean area. There are many passes crossed by carriage roads, but functionally these are now replaced by the two great international railway routes of the Simplon

and the St. Gothard (Fig. 14). On Basel, admirably placed where the Rhine breaks through between the Jura and the Black Forest and turns sharply northwards to enter the Rhine Rift valley, converge routes from Paris, from Brussels, and from Cologne, and thus from Holland and western Germany. From Basel the northern end of the St. Gothard tunnel can be reached either *via* Lucerne or *via* Zurich, and that tunnel connects the valley of the Reuss, a tributary of the Aar, with the Ticino, a tributary of the Po. From the Upper Ticino valley the railway passes to Lake Lugano, an arm of which it crosses, and then skirts the end of Lake Como, to reach Milan. The rival Simplon route takes off from Dijon, on the main Paris-Lyon-Marseille line, and crosses the Jura to Lausanne. It then ascends the Rhone valley to Brigue, whence the Simplon tunnel brings it to a feeder of the Tosa, which enters Lake Maggiore. That lake is skirted till the Plain of Lombardy is reached, a direct connection being given both to Milan and to the cities of the western part of the Plain. The main Simplon route is now supplemented by the Lötseberg route, which gives a through connection from Paris via Berne. The Lötseberg tunnel passes through the Bernese Oberland between the village of Kandersteg and the Rhone valley, the line joining the main route at Brigue. The Great St. Bernard Pass, leading from the bend of the Rhone at Martigny to Aosta on the Dora Baltea tributary of the Po, has lost the importance which it possessed in earlier times, though it is used for motor traffic. Much the same may be said of the Splügen Pass, reached from the ancient town of Chur (Fig. 15), placed near the point where Vorder and Hinter Rhine meet. Chur, it should be noted, is nearly due south of Ulm (p. 81).

Of much interest, both in relation to relief and to the lines of communication, is the situation of the chief towns of Switzerland. Apart from Basel, the larger towns all lie in two irregular rows in the Midland Region. One

row is placed at the base of the Jura, and beginning at Geneva, is continued through Neuchâtel and Solothurn to the railway centre of Olten. The other row begins at Lausanne and is continued through Berne, the capital, to Lucerne, Zurich, Winterthur and St. Gallen. Four of these towns, Zurich, Basel, Geneva and Berne, have more than 100,000 inhabitants, but only Zurich reaches 200,000, and Berne is the smallest of the four. Its position on a bend of the Aar, nearly in the centre of the Midland Region, enables it to keep in touch with all parts of the country, and it is the focal point of the railway system within the country, while Basel, Zurich and Lausanne are of more importance in connection with international thoroughfares.

Associated with the development of these great thoroughfares, we have the growth of industry within the country. There is a large textile industry, cotton being manufactured at Zurich, silk at Zurich and Basel, embroideries at St. Gallen and elsewhere. The absence of coal makes the effective utilisation of water-power essential, and the Swiss are noted for their engineering skill and for their manufactures of electrical and textile machinery. Scientific instruments are made at Geneva, less favourably placed for the import of bulky raw material than the northern towns, with their easy access to Germany.

The stability of Switzerland is associated on the geographical side with the multiplicity of her external relations by means of the great through-routes. By them she must import both food and raw material and export the products of the industry of her skilled and educated people. A neutrality based on tolerance and respect for other points of view is essential to her prosperity and even to her continued existence.

With a total area of under 16,000 square miles, somewhat less than that of Denmark, Switzerland ranks among the smaller states of Europe. Its population, of just under four millions, gives it a relatively high density especially when the great extent of waste land is borne in mind.

THE FORMER AUSTRO-HUNGARIAN EMPIRE

As already noted, the basis of the post-war division of Austria-Hungary was the desire to establish racially homogeneous states. This ideal is most nearly attained in Austria—whose inhabitants are almost wholly German-speaking, though not all German-Austrians are included—and in Hungary, where 90 per cent. of the people are Magyars, though, again, not all the Magyars of the former Hungary live within the new frontiers. In Czechoslovakia, on the other hand, Czechs and Slovaks together make up less than 64 per cent. of the population, nearly 23 per cent. are Germans, and there are considerable numbers of Magyars and Ruthenians (Little Russians). Exact figures for Roumania are not available, but there also a considerable non-Roumanian element prevents the population being homogeneous, Magyars, Germans and Ruthenians being present. Not only, then, is the population of this part of Europe diverse, but the different groups overlap one another.

RELIEF. Three distinct relief features are present in the lands formerly included in Austria-Hungary—the old crust-block of Bohemia (the Bohemian Diamond), the Hungarian Plain, and the mountain chains which encircle the latter.

Bohemia (Fig. 12) is demarcated by the Bohemian Forest on the south-west, and the Ore Mountains to the north-west, these two diverging from the mountain knot of the Fichtel Gebirge, and by the Sudetes on the north-east. On the south-eastern side its limits are less clear, for here there is no well-defined belt of hills, but only the upland of the Moravian Heights. Within the bounding walls of the Diamond is an undulating region, lower towards the north, especially in the Elbe valley, but showing nowhere any considerable tract of level land. It is drained by the Upper Elbe system, the most im-

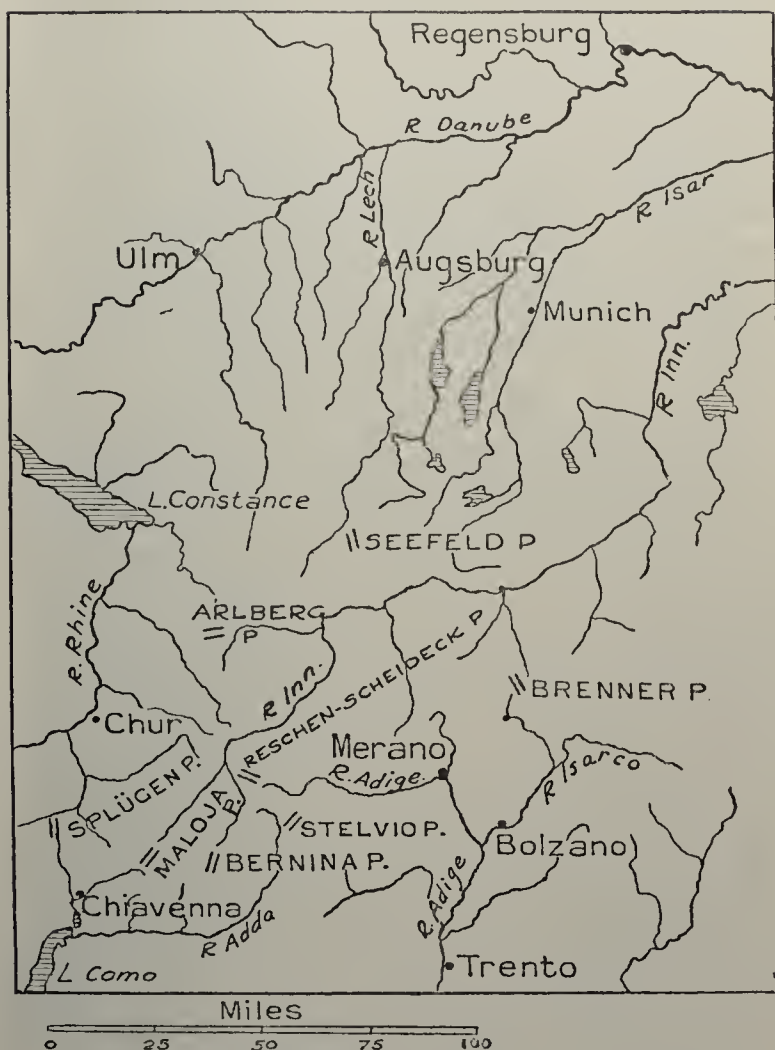


FIG. 15.—PASSES OF THE EASTERN ALPS.

Note the transverse connection between the Rhine and the Inn by the Arlberg pass, and the numerous passes connecting the long valley of the Inn with the rivers flowing to the Adriatic Sea.

portant tributary being the Moldau, which rises near the southern end of the Bohemian Forest and nearly bisects the southern half of the Diamond. The Elbe is navigable only so far as the junction of the Moldau, while fairly large boats can reach Prague on the latter river, and smaller ones can ascend to Budweis. But despite the direction and navigability of the rivers, Bohemia has always been more closely connected with the Danubian Lands to the south than with the North German Plain.

The Hungarian Plain is so nearly ringed round with mountain chains, although it is traversed by the Danube, that its limits are best realised by looking at the mountains.

The great chain of the Central Alps is continued from Switzerland into Austria, but the Austrian Alps are lower (under 13,000 feet), and have much less permanent snow than the Swiss Alps. Of the passes the Brenner (p. 81) is the most important. Before the war Austria extended far over the pass and the crest of the adjacent Alps, including the whole of the Upper Adige (Etsch) valley. The Italian frontier has now been thrust up to the crest and to the Brenner, so that a considerable area whose inhabitants are German-speaking now lies within Italy. The Semmering pass, much further east, gives access by difficult and circuitous routes to Trieste and the Adriatic from Vienna. A special feature of the Eastern Alps is the frequent presence of longitudinal valleys containing streams which flow for a part of their course parallel to the crest in which their headwaters rise. The Middle Inn valley (Fig. 15) is one of the most important of these, and it is connected by the Arlberg tunnel to the Rhine valley between the town of Chur and Lake Constance. This tunnel gives a direct route from Zurich to Vienna, past Innsbruck.

In the north the Eastern Alps appear to end in about the meridian of Vienna; but to the south-east they are continued by a belt of high ground which acts as a barrier



FIG. 16.—THE HUNGARIAN PLAIN AND ITS ENCIRCLING MOUNTAINS.

The Plain falls into three sections, the Great Plain to the east of the north-south section of the Danube, the Lesser Plain to the north-west of the Bakony Forest, and the undulating south-western area.

between the plain and the Adriatic Sea, and further south becomes the Dinaric Alps of the Balkan Peninsula. The Carpathians, in the strict sense, begin to the east of the Upper Oder valley (Fig. 13) and sweep round in a great south-easterly curve. They then change suddenly in direction and run westwards as the Transylvanian Alps. These, after the interruption where the Danube leaves the plain through the gorge known as the Iron Gate, are continued with a new change of direction as the Balkan Mountains. But this is not the whole story (Fig. 16). On their inner (concave) side are certain accessory mountain and hill groups which modify the apparent simplicity of this description. From the western end the White Mountains and Little Carpathians extend south-westwards towards the Danube at Pressburg (Bratislava), and, with the lower hills on the other side of the river, separate the basin of Vienna from the Lesser Hungarian Plain. East of the White Mountains is an irregular mass of high ground, containing in the Tatra group the highest of the Carpathians, and extending in the Matra Mountains far south into the gap between the rivers Danube and Theiss (Tisa). Still further east, however, this inner belt of mountains is absent, and the Forest Carpathians form a single chain of no great elevation which separates the steppe-like Greater Hungarian Plain from the wider and more arid steppes of European and Asiatic Russia. So easily crossed are the Forest Carpathians by many passes that they have never been a real barrier to invaders. Here it was that the Magyar horsemen, coming from the wastes of Asia, found an entrance into the lands which became Hungary.

Beyond this narrowed region stands the great bastion of Transylvania, rising steeply above the surface of the plain. Its hilly interior is dissected by the great rivers forming the tributaries of the Theiss. The Alt or Aluta, however, breaks through the Transylvanian Alps at the Red Tower Pass, and flows across the outer or Wallachian Plain to enter the Danube direct.

Two minor relief features remain to be noticed. From the bend of the Danube upstream from Budapest there stretches south-westwards an upland belt, the Bakony Forest, with the long and narrow Lake Balaton at its base. Still further to the south-west, between the Drave and the Save, is a long stretch of hill country, serving as a transition area, both as regards relief and population, between the Eastern Alps and the hills of the Balkan Peninsula south of the Save river.

The result is that the inner Danubian Plain, in the large sense, can be divided into three sections. From the Carpathians and Transylvania to the Danube extends the Greater Plain or Alföld, watered by the Theiss. This is the true Magyar land. North-west of the Bakony Forest lies the Lesser Hungarian Plain, traversed by the Danube which here breaks up into several arms enclosing islands. From the Bakony Forest there extends to the Drave and the Danube an undulating, loess-covered belt where Magyars are mixed with Germans. Beyond the Drave the land of the South Slavs begins. For a part of its course that river now forms the boundary between Hungary and Yugoslavia (Yugo = south). But though Yugoslavia, or the Serb-Croat-Slovene State, thus extends into Central Europe, its centre of gravity lies within the Balkan Peninsula, and it is better regarded as a Balkan State.

RELIEF AND RACIAL DISTRIBUTION. We have seen that the Hungarians entered the Greater Hungarian Plain across the Forest Carpathians. They were neither the first nor the last invaders from the Asiatic steppes, even if they were the only ones who gained a permanent footing within the Carpathian crescent. The racial patchwork of the old Austria-Hungary was the result of a long action and reaction between invaders and invaded, and the land forms naturally exerted great influence during the struggle.

In the early centuries of our era the Romans, with the

object of protecting a weak point in their long land frontier, founded the province of Dacia, which extended over both Transylvania and the Wallachian Plain. The province was soon abandoned, but the descendants of the Romanised inhabitants, who speak a language derived from Latin, and call their country Romania, the land of the Romans, are the Roumanians of to-day. Before the war Roumania consisted of the plain of Wallachia, itself but a continuation of the Russian Black Sea plain, and of the plateau region of Moldavia. Many Roumanians, however, lived in Transylvania, where they were mingled with Magyars, and with Germans (Saxons) who had been settled there to act as guardians of the gate.

Of the Slavs we have already said something (p. 78), but we have to note that the Magyar occupation of the Hungarian plain separated them into two great groups, the West and South Slavs. To the former belong: (1) the Czechs of the Bohemian Diamond, and also of Moravia, which is essentially the area lying between the Moravian Heights on the one hand and the White Mountains and Little Carpathians on the other, drained by the March; (2) the Slovaks of the hill country which extends (p. 98) from the Carpathian crest southwards towards the gap between Danube and Theiss; (3) the Poles, north of the Carpathian crest. Further east the Ruthenians are Slavs of the Russian group without the cultural individuality of the Czechs and Poles, or even of the Slovaks. The South Slavs include: (1) the Serbs of the Balkan Peninsula, who belong to the Orthodox Church; (2) the Catholic Croats of the hilly region south-west of the Drave, and of Dalmatia; (3) the Alpine Slavs or Slovenes of the north-west.

Two other complications remain to be noted. The Germanic peoples have always kept their hold on the Austrian Gate, upstream from Vienna, and with a solid mass of German-speaking peoples behind them, in the Northern Alps, the Bavarian High Plain and the Central

Uplands, they have exerted a continuous eastern push, just as they did from Brandenburg in the North German Plain. They have penetrated the hilly margins of the Bohemian Diamond; they have infiltrated the plain, particularly in its higher areas; as already stated they founded colonies in Transylvania. As regards the plain it is particularly interesting to note that the Hungarian capital, Budapest, is in origin a twin city. On the western bank of the Danube stands Buda (German, Ofen), originally a German fortress and outpost; its relation to the hill belt of the Bakony Forest should be noted. Pest, on the lower eastern bank, is similarly a Magyar outpost of the Alföld.

The other complication resulted from the Turkish advance through the Balkan Peninsula into Hungary and to the approaches of Vienna. In its early stages it led to the flight of great numbers of Slav refugees from the peninsula into the south of the Hungarian Plain, as well as to the hilly regions of the west (including Croatia-Slavonia). In the southern part of the plain, therefore, Slavs are mingled with Magyars and Germans.

This survey enables us to look at the separate states with some appreciation of the problems involved.

AUSTRIA

With an area twice that of Switzerland, that is about 32,000 square miles, and a population of 6½ millions, Austria is now a small state. It is traversed by the Danube from Passau to a point just west of the Czechoslovak river-port of Bratislava, but is essentially a mountain and for the most part an Alpine state. The lower region near the Danube is, however, important as it permits of the cultivation of some wheat and sugar beet. The hilly regions produce timber, and have a cattle-rearing industry like that of Switzerland, but the limited cultivated lands can for the most part produce only hardy crops like rye and oats. There

is practically no true coal, but brown coal or lignite is mined near Graz. The chief minerals are salt and iron. Salt is produced especially in the Salzkammergut, the region where the three provinces of Upper Austria, Salzburg and Styria meet. The deposits here have been worked since prehistoric times, and the salt trade was important in linking together economically Austria and Bohemia, which depended on Austrian salt. Iron occurs in Styria and Carinthia and iron manufactures are carried on at Graz and Klagenfurt, as well as elsewhere.

The most striking feature of Austria to-day is the disproportionate size of Vienna, the capital. Though the population has dropped below the pre-war total of two millions, Vienna contains nearly 29 per cent. of the people of Austria (cf. Copenhagen, p. 88). Before the war the huge size was justified by the fact that Vienna was the centre of a great empire, and was so placed as to command communications with all its parts. The advantage of position remains, but the new custom barriers are a serious obstacle to trade relations. The only other towns which have a population exceeding 100,000 are Graz and Linz, the latter on the Danube upstream from Vienna, the former on the Mur tributary of the Drave.

CZECHOSLOVAKIA

With an area of over 54,000 square miles and a population now estimated as over 14 millions, Czechoslovakia is much larger than Austria and has more abundant resources. It has a peculiarly elongated shape from east to west, owing to the inclusion of the Carpathian slopes with their Slovak and Ruthenian peoples. The broader western portion, inhabited by the industrialised Czechs and by Germans, is richer and better peopled than the narrowed eastern area. Prague (Praha), the capital, shows even more markedly than Vienna the disadvantage of an eccentric position in relation to the state as a whole. It has to be noted further

that while Vienna was the railway centre for the whole of Austria-Hungary, and has lines radiating outwards from it to all parts of the present Austria, Prague was only the centre of the railway system of Bohemia, and of the international routes which connected Germany and Austria-Hungary. The railways of Slovakia and Carpathian Ruthenia are but sections of the lines which in the old Hungary converged on Budapest. Apart from Prague (about 700,000 inhabitants) the only large town is Brunn (Brno), in Moravia, with over 200,000.

The great contrast between the western part of Czechoslovakia, which includes Bohemia, Moravia and part of Austrian Silesia, and the eastern section, made up of Slovakia and Carpathian Ruthenia, is due to the fact that the former contains both the richest mineral deposits and the best agricultural lands. The most fertile region is in the north of Bohemia, where in the Elbe, Eger and Moldau valleys sugar beet is cultivated on a scale large enough to permit of extensive export. Next to the German plain, indeed, this is the most extensive sugar-producing region of Europe. In this region wheat is also produced. In the country as a whole, however, rye and oats are the cereals most extensively grown, a fact associated with the relative infertility of the eastern section. Czechoslovakia is thus obliged to import cereals, especially wheat.

Among minerals coal is very abundant, the republic having rich deposits both of true coal and of lignite or brown coal. The most important beds are those at Ostrau, near Teschen (p. 94), in what was formerly Austrian Silesia, those near Kladno, west of Prague, and those near Pilsen. Lignite is worked especially near Teplitz, at the base of the Ore Mountains. Iron is not present in large quantity, and the Bohemian iron industry depended formerly on the iron ore obtained from Styria. The presence of coal has led to a large development of industry, particularly textiles, glass, porcelain, beer and fancy goods. Pilsen is the great beer-making centre, Brunn has woollen

industries, and Prague has a great variety of manufactures, including textiles, machinery, gloves and others. Bratislava is now an important river-port, and Czechoslovakia has now a free zone at the German port of Hamburg, while another is to be established at Stettin on the Oder.

HUNGARY

Of all the new states Hungary has suffered most severely from the drawing of the new frontier lines. With an area of about 36,000 square miles and a population of about $8\frac{1}{2}$ millions it has less than one-third of the territory of the former state, and more than one-third of the population. The loss of the forested marginal hills, and of a considerable part of the southern Alföld to Roumania and Yugoslavia has greatly diminished its resources, and with the passing of its former port Fiume from its control it has no direct access to the sea.

Though some coal occurs in the bend of the Danube near Budapest, and also near Pécs in the south-west, Hungary is essentially an agricultural state, and the fact that wheat and maize are the most important cereals, both as regards area and yield, is an indication both of the nature of the climate and of the fertility of the soils. The original steppe-like appearance of the Alföld has been largely modified, extensive planting having taken place; many of the original swamps have also been drained by the regulation of the turbulent Theiss system. Apart from the loss of the timber resources the new frontiers mean that flood prevention is now much more difficult than formerly, when the mountain streams were under Hungarian control. The fact that wheat is by value the highest item in the list of exports, animals for food or draught coming second, is an indication of the progress made by cultivation at the expense of the former stock-rearing industry of the plain. Horses, cattle and pigs are, however, still very largely reared. That timber is

now the highest item by value in the list of imports is an indication of the changes due to the new frontiers. Next to timber come cotton fabrics. This fact, together with the small import of raw cotton, shows that Hungary has few industries save those concerned with the working up of its own agricultural raw material.

The only large town of European type is Budapest, with a population of under a million in the city proper, and over this figure if the suburbs be included. The other towns which figure on the map are for the most part gigantic villages, showing traces in their arrangement of their primitive origin as tent-settlements of the ancestral nomads.

ROUMANIA

Compared with the other Alpine-Carpathian states Roumania covers a very large area (122,000 square miles), but with a population of about $17\frac{1}{2}$ millions it has a considerably lower density. To its original territories of Wallachia, the slopes from the Transylvanian Alps to the Danube, and Moldavia, the land between the Carpathians and the river Pruth, drained by the Sereth, have been added Bessarabia, Bukovina (the area between the Upper Pruth and the crest of the Forest Carpathians), Transylvania and a part of the Hungarian Plain. As contrasted with the other states it possesses a considerable stretch of coast-line, with ports of its own. The chief river ports of the Danube are Galatz and Braila, and the main Black Sea port is Constantza. The last is connected to Bucharest, the capital, by a railway which crosses the Danube by a bridge at Cernavoda, for the river takes a great northward bend before entering the Black Sea by its three mouths, of which the central or Sulina arm is the main waterway. The land between the bend of the Danube and the coast forms the Dobruja, a steppe-like country.

The plains, both in Wallachia and Bessarabia, are remarkably fertile, producing maize and wheat in abund-

dance. Maize forms the main cereal food of the peasants (cf. the polenta of Northern Italy), while the more valuable wheat is mainly grown for export. Transylvania is largely forested, and timber comes after cereals as the main export of Roumania. Petroleum stands third, mineral oil being produced on the slopes of the Carpathians and the Transylvanian Alps, especially near Ploieshti (Ploesti), north of Bucharest. Salt is also produced on the Carpathian slopes, and various other minerals are present, including coal and iron, in the Banat region of the south-west; but Roumania is predominantly an agricultural country, industry being little developed. Bucharest has over 300,000 inhabitants.

THE BALKAN STATES

Yugoslavia, Bulgaria, the small state of Albania, with a population of less than one million, and the limited part of Turkey which lies in Europe, are most conveniently regarded as an annex to Central Europe. All differ notably from Greece, which is essentially a part of the Mediterranean Lands. In the northern, wider part of the Balkan Peninsula the climate, except for a small strip on the Dalmatian coast, is of the Central European, not the Mediterranean type, having cold winters and warm, moist summers. The natural vegetation is similarly Central European, the forests including beech and oaks. The cultivated plants, again, which include maize and wheat among cereals, tobacco (Plate V) and sugar beet, and the more temperate fruit-trees, especially plums, with the vine, are those characteristic of the lands to the north, the olive being excluded save on the Dalmatian coastal strip (Plate II).

The most extensive level areas are found in Bulgaria, north and south of the Balkan Mountains, but Yugoslavia extends into the Hungarian plain (p. 112). As a whole the peninsula is remarkable for its considerable elevation above sea-level, and for the complexity of its structure, small



THE DANUBE, EAST OF BELGRADE, AT SUNSET

Such broad rivers tend to form frontier lines, but, as contrasted with mountain chains, there is rarely such a physical difference between the two sides as to make them permanent barriers between human groups. Since the war the Danube here is no longer a frontier, the new Yugoslav state extending across it.

Photo by Č. Krušević.

basins alternating with mountain chains. The river valleys are thus of great importance as affording lines of communication, and two great international routes traverse the broad northern section. Both start from Belgrade, the capital of Yugoslavia, situated on the Danube at the junction of the Save. Downstream another right-bank tributary of the Danube, the Morava, gives a line of access to the hilly interior. From the Morava it is possible to reach the Vardar valley, the river entering the *Ægean* to the west of the Greek port of Salonika. Salonika, where there is a free zone, is the chief port of Yugoslavia, which has only difficult access to the shores of the Adriatic. The other route takes off from the Morava valley by way of the Nishava tributary and leads to Sofia, the capital of Bulgaria. From Sofia the route is continued into the Maritsa valley, from which Constantinople is reached.

Yugoslavia has an area of 96,000 square miles and a population of 12 millions. The new kingdom includes not only the old Serbia, with Montenegro, Bosnia, Hercegovina and Dalmatia within the peninsula, but also large tracts of land north of the Danube-Save line obtained from Austria and from Hungary. Considerable mineral resources occur, including coal and copper, but there is little large-scale industry, and the state depends mainly on the products of its agriculture and stock-rearing (especially pigs), its fruit (especially plums in the form of prunes) and its forests. There used to be little difference in size (about 100,000) between Belgrade, the former capital of Serbia, and Agram or Zagreb, the former capital of Croatia-Slavonia, placed in a fertile basin on the River Save; but Belgrade has grown rapidly and is now estimated to contain 250,000 people.

Bulgaria has an area of about 40,000 square miles, with a population of 5½ millions, of whom 200,000 live in Sofia. Its main exports are cereals and tobacco, but its production of attar of roses is interesting.

European Turkey has shrunk greatly, and Constantinople, with a population of less than one million, is no longer the capital. A train ferry across the Bosphorus connects it with the new capital, Angora, by the Anatolian Railway. The population of Constantinople is very mixed, including many Greeks. Before the war it was a very important trade centre, owing to its wonderful position at the crossing of routes from Europe into Asia Minor, and from the Black to the Ægean Sea, and its fine harbour, the Golden Horn.

For Balkan and other problems of post-war Europe see Bowman, *The New World*, Fourth Edition (Yonkers-on-Hudson, 1928); also *Handbooks of the Historical Section Foreign Office* (London, 1920); Cisar and Pokorny, *The Czecho-Slovak Republic* (London, 1922).

CHAPTER VII

EASTERN EUROPE : RUSSIA AND THE NEW STATES

THE Königsberg-Odessa Line, which we have taken (p. 5) as marking approximately the limit of Eastern Europe towards the west, has never been a political boundary. But though in the pre-war period Germany extended to the east of it, and Russia stretched over it to the west, particularly in the great salient of Russian Poland, and also if somewhat less markedly in Bessarabia, the land between the Dniester and the Pruth, now Roumanian, we may yet say broadly that European Russia coincided formerly with Eastern Europe. The old Russia in Europe covered fully half the total land surface of the continent, and contained some 132 million people.

THE RUSSIAN PLATFORM. Thus the first characteristic of Eastern Europe is its vast size. This feature is apt to be obscured on atlas maps by the fact that cartographers commonly draw the map of the Russian lands on a smaller scale than that used for other European countries. The second characteristic is the relative simplicity of structure (Fig. 17). We have already seen (p. 88) that the Baltic Shield, that ancient crust-block which forms so large a part of Scandinavia and includes Finland (Fig. 1), is bounded on its eastern and southern sides by a depression, largely flooded by water, which extends from the White Sea to the Gulf of Finland. Excluding this Shield, Eastern Europe consists mainly of the great Russian Platform. From the Arctic Ocean to the Caspian Sea and the Caucasus Mountains ; from Lake Ladoga and the Gulf of Finland

to the Black Sea ; from the Carpathian slopes to the Ural Mountains—there stretches a vast series of unfolded and undisturbed sedimentary rocks, of various ages. The more northerly part of the platform so formed is covered by glacial deposits, but, as contrasted with the North German plain, these deposits are not thick enough to conceal completely the underlying rocks.

The general uniformity is broken to some extent in the south, where a ridge of granitic rocks extends in a north-westerly direction from the Sea of Azov across the great elbow of the Dnieper. Where the river cuts its way through the granite, below the town of Ekaterinoslav, navigation is impeded by rapids ; but even this belt of granite has little effect on surface relief. The whole surface is indeed remarkably level. Nowhere does it rise much above 1,000 feet, the Valdai Hills forming one of the most notable swellings. A large part lies below 600 feet, and the whole may be regarded as a plain.

Of the marginal mountain belts the Caucasus are a continuation of the fold-mountains of Central Europe, the mountains of the south-eastern coast of the Crimean Peninsula forming a broken link between the Balkan Mountains and the Caucasus. The last rise to over 18,000 feet, and are extensively glaciated. The Urals seem to resemble the central uplands of Germany, that is, are probably remnants of an older mountain chain which has undergone uplift. They do not attain an elevation of much over 5,000 feet, and are devoid of permanent snow. On the European side they rise very gently from the plain. The Timan Hills, though not high, are structurally interesting because of the older rocks which crop out in them.

The extent of the Russian Platform and its generally level surface means that the climatic type is broadly similar throughout, if with much difference in detail. As compared with the rest of Europe the winters are characteristically cold, the cold increasing north-east-



FIG. 17.—THE STRUCTURE OF EUROPEAN RUSSIA (*cf.* Fig. 1. p. 7).

1. The Ural Mountains; 2. The Baltic Shield; 3. Recent deposits;
4. The Russian platform; 5. Young fold-mountains, forming the Caucasus, Carpathians, etc.

wards; equally characteristic is the summer rainfall, the total fall diminishing to the south-east, where also the period of fall tends more and more to be limited to the early summer. The contrast with the variety of relief and of climatic type in the rest of Europe is so great that one tends to think of Eastern Europe throughout as uniform and monotonous. But this is largely a misconception; it would be as true to say that the differences between the parts are as great as in Western Europe. The appearance of uniformity is due mainly to the fact that, because marked relief features are absent, what would elsewhere be regarded as separate natural regions here grade into one another. There are no obvious boundaries; but instead wide zones of transition between one region and the next.

The effect of this on man has been very great. No unalterable physical features separate one natural region from the next, or determine the direction of the main lines of communication. Both the boundaries of the different types of communities and the great through routes have undergone constant changes, because they have depended on such phenomena as the distribution of forests and the presence of swamps, which can be modified by human effort. Russian history, so complex and apparently so meaningless, from the geographical side is explicable as man's struggle to find limits where nature has set none, to link together areas very different in the sum-total of their geographical elements but topographically similar and structurally continuous. To understand the meaning of these statements we must look first at the distribution of vegetation, which is an index at once of climate and of possible modes of life, and second at the zones of contact with surrounding lands, and the varying relations of internal lines of communication to these, as shown by the course of historical events.

THE PLANT COVER. The main points in regard to this are shown in Fig. 18, but it should be realised that the



FIG. 18.—VEGETATION BELTS IN EUROPEAN RUSSIA.

1. Tundra and mountain flora; 2. Coniferous forest; 3. Mixed forest;
4. Grasslands; 5. Steppes and semi-desert; 6. Mediterranean flora.

From *Hettner* (modified)

map is necessarily very generalised, the transitional belts having been omitted for the sake of clearness. We may conveniently begin with the belt of mixed woodland, the home of the true Russians. The forest here contains, in addition to conifers, such deciduous trees as oaks and linden, but not beech. Such deciduous trees will not tolerate excessively cold winters, especially when windy, and require a considerable summer rainfall. In consequence the mixed forest occupies, or originally occupied, southern and south-western Finland, and a large section of the centre of the Russian plain, particularly towards the west. Its northern limit is a line running to the south of Lakes Ladoga and Onega, and then turning to the south, to strike the river Kama before it enters the Volga at the great bend below the town of Kazan. The southern limit is marked by a row of towns, a fact of considerable historical importance. It is an undulating line which passes from Kiev on the Dnieper to Tula, on a tributary of the Oka, itself one of the great feeders of the Volga, and then to Kazan on the Volga (Fig. 19).

South and south-east of this line lie the grasslands, becoming semi-deserts in the dry region round the Caspian Sea. The true grasslands, as contrasted with the semi-deserts, correspond broadly to the distribution of the famous Black Earth, a highly fertile soil type rich in humus, or decaying vegetable matter, which when broken down by bacteria forms valuable plant food. The soils of the Black Earth area have proved to be admirably adapted for wheat production, but the grasslands were for long the home of pastoral nomads.

North of the belt of mixed woodland the climate becomes unsuited to deciduous trees, and coniferous forest, the equivalent of the taiga of Asia, appears. Because of the thinning out of the mixed woods to the east, taiga and grasslands abut on one another in the region crossed by the Kama river; further west they are separated by a broad belt of deciduous forest. On

the shores of the Arctic Ocean, again, conditions are too severe to permit of the growth even of pines and firs, and a strip of frozen tundra appears, though within Europe this is comparatively narrow. One other vegetation type remains to be mentioned. On parts of the European shore of the Black Sea, particularly on the south-eastern coast of the Crimean peninsula, the winters are mild and rainy, and the vegetation is of the Mediterranean type.

RESOURCES OF THE VEGETATION ZONES. Of the six zones of vegetation mentioned, the Mediterranean belt is too narrow to be of much significance. Further, by considering the tundra and the taiga together as areas in which little cultivation is possible—or none in the tundra proper—and the grasslands and semi-deserts as areas originally mainly pastoral, we may reduce the total to three.

In tundra and taiga the natural resources are fishing and hunting. Hunting includes the collection of furs, and the domestication of the reindeer has given such primitive peoples as the Lapps and the Samoyedes an important accessory resource. Further south a certain amount of stock-rearing can be carried on. In modern times the softwood timber yielded by the pines and firs has become highly important. In addition to tar and pitch, which have had commercial value for a prolonged period, paper pulp has quite recently formed a large export, particularly from Finland.

The mixed forest zone has carried a denser and more settled population since very early days. In addition to following such primitive occupations as hunting in the woods and fishing in the great rivers, its inhabitants can engage in farming, including both the tilling of the ground and stock-raising. In the Baltic area conditions are not very favourable for cultivation, and the poorer cereals, like rye, barley and oats, with textile plants in the shape of flax and hemp, are mainly grown. Further south the number of possible crops becomes much greater. On the

other hand, the grasslands and semi-deserts for a long period of time seemed suited only for stock-rearing, and the spread of cereal cultivation, particularly of wheat, is a comparatively modern phenomenon within the steppe area proper.

We have thus in Russia three great—but undemarcated—natural regions; the northern area of taiga and tundra, which seem mainly suited for the collection of wild produce, with some stock-rearing; the central area, where mixed farming was originally carried on in clearings in the woodlands; the grasslands and semi-deserts, the home of nomadic stock-rearers. In a very broad and general sense we may say that each of the three had in early days its own racial stocks, adapted to the local conditions. Russian history hardly begins before the 9th century of our era. At that time a part of the mixed forest zone was occupied by the Slavs or Russians proper, who were separated from the Baltic coast by another forest-dwelling racial stock of whom the present Letts and Lithuanians are the descendants. Tundra and taiga were occupied by Finnish stocks. Even then the grasslands and semi-deserts were occupied by Turkish peoples from central Asia, and a fresh inroad of Asiatic horsemen was to occur a few centuries later.

STAGES IN THE GROWTH OF RUSSIA. (1) *Kievan Russia*. Beginning with this conception of Eastern Europe as an area which, despite its physical uniformity, has always been diverse as regards its plant cover, its resources and its racial elements, we have next to consider the causes which led to the growth of a vast Russian Empire. Among these causes external influences played a large part, and the zones of contact with the outside world thus become important.

From the days of classical Greece to those of the mediæval trading republics, the shores of the Crimea attracted Mediterranean man; but while the climate and natural vegetation resembled those of Greece and Italy,

behind the coastal strip lay lands of very different characters, inhabited by "barbarian" peoples. The policy adopted successively by Greeks, Byzantines and Genoese showed in consequence not a little analogy to that of the European powers who in our own days have founded trading stations on the coast of China. The conditions were such as to make exchange of goods profitable, but the risk of an advance into the troubled interior was too great to be undertaken. Thus the long period of Mediterranean settlement on the Crimean coast had little permanent effect on Russian history.

Much more important was another less favoured part of the Black Sea coast, that bay into which open the Rivers Dniester, Bug and Dnieper, on the shores of which stands the modern grain port of Odessa. Of the three the Dnieper is the chief. It rises not far from the source of the Volga, in that central plateau which reaches its greatest height in the Valdai Hills, and is the main water-parting of Russian rivers. Here also rises the Düna or Western Dvina, which enters the Gulf of Riga.

On its journey southwards to the Black Sea the Dnieper, upstream from the town of Kiev, receives a large right-bank tributary, the Pripet. This flows in a west-to-east direction, through an extensive series of marshes, the Pripet or Pinsk swamps. These swamps have always been a great barrier to movement, both from the north (i.e. from the Baltic area) to the south, and from the west, that is, from Poland, to the east. All early lines of communication tended to avoid them, routes from the Baltic to the Black Sea in particular being diverted to the east or to the west.

East of the marshes an important route was that which utilised the main stream of the Dnieper. According to the story, towards the end of the 9th century of our era the Russian Slavs called in certain Swedish folk, the Varangians, to aid them in organising their territories. The Varangians sailed into the Gulf of Finland, found their

way by the Neva river into Lake Ladoga, and followed the Volkhov, the stream which enters Lake Ladoga from the south, to its exit from the smaller Lake Ilmen (Fig. 19). Here arose Novgorod ("new town"), called The Great because of the part it played in mediæval commerce. From Novgorod to the shores of the Black Sea a direct route led by way of Lake Ilmen, its feeder the Lovat, and the Dnieper, the headstream of which could be reached by a portage from the Lovat. Not only was trade carried on by this route, but since from the mouth of the Dnieper the Varangians could reach Constantinople, they introduced the Greek or Byzantine form of Christianity among the Russian Slavs, and thus brought them into contact with Mediterranean culture.

Later, Novgorod became an important Hanseatic town, as was also Riga, which was connected with the Novgorod-Black Sea route by way of the Western Dvina. The influence of the Hanseatic League and of the Teutonic Knights (p. 79) meant, however, that the whole of the north-western strip, from our selected limit at Königsberg to Lake Ladoga, was Baltic and not Russian. Racially, the inhabitants belonged to the Finnish or the Lithuanian stocks, not the Russian Slav one, and cultural influences came from the Baltic States further west, not through Constantinople.

The real centre of this early Russia was Kiev on the Dnieper, and as it is still an important city, its advantages of position should be noted. It stands (1) in the junction zone between forest and grassland (p. 122); (2) on a navigable river forming part of a great highway; (3) at the junction of the left-bank tributary of the Desna, the headstream of which approaches the Oka, a right-bank tributary of the Volga, the greatest river of Europe.

This first, or Kievan Russia, was overthrown by the Mongol invasions of the 13th century. The Mongols advanced through the wide Asiatic Gate, the gap between the Urals and the Caspian Sea, and occupied the grass-



FIG. 19.—NATURAL ROUTE-LINES AND HISTORIC TOWNS OF EUROPEAN RUSSIA.

The position of St. Petersburg is indicated only by a town-dot, that of Lake Ilmen, from which the River Volkhov flows to Lake Ladoga, by the stippled area south of the town of Novgorod. The dotted lines show the early routes, which utilised the great rivers so far as possible.

lands. The forest belt possessed no attractions for them, though for a time they succeeded in making the Russian Slavs pay tribute to them as overlords.

(2) *The Rise of Muscovy.* The effects of the Mongol or Tartar invasions were not only great, but permanent. We can, indeed, only understand the break-up of Imperial Russia into new states in the post-war period by noting some of those effects.

In the first place, the Mongol occupation of the grasslands was unproductive. The invaders were warriors, plunderers, to some extent carriers of trade goods; but the tribute from the Russian Slavs was fundamentally an expression of the fact that they had to be fed by the industry of the farmers of the forest belt. Secondly, while Kiev was a marginal city between forest and grassland, the Mongol advance led the Russian Slavs to seek refuge within the heart of the forest, and attempt to consolidate themselves there. What actually happened was that the Tartar Khan found it convenient to appoint one Russian prince as tax-farmer, entrusting him with the duty of collecting tribute from all the Russian states. This ruler first overcame his rivals, and then found himself strong enough to throw off the Tartar yoke.

This dominant principality was that of Muscovy, which took its name from the town of Moscow, on the Moskva, a tributary of the Oka. Thus we have next to look at the Russian "Mesopotamia," the area between the Oka and the Volga before the two rivers unite at the town of Nizhni Novgorod. Oka and Volga both rise in the central plateau area, which extends southward from its culminating point in the Valdai Hills, though at a considerable distance from one another.

The actual plateau, despite its elevation, is swampy and unsuitable for settlement, but as they leave it the rivers flow in definite valleys, affording good agricultural land. The definite emergence from the plateau may be said to be marked by the towns of Rshév on the Volga and

Kaluga on the Oka. Downstream from these towns the two flow roughly parallel to each other, with an easterly course, Moscow being virtually midway between them. Therafter they change in direction, the Volga flowing north-eastwards and the Oka south-eastwards, both finally swinging round again to unite at Nizhni Novgorod. The two stream lines served as highways of migration, and both on them and on certain tributaries important towns arose. We have already spoken of the Moskva; the Klyasma, another feeder of the Oka, has on its banks the town of Vladimir, which preceded Moscow as a Russian "capital." It was in this area, between Oka and Volga, that the new Russia arose after the fall of Kievan Russia.

The contrasts between the two are striking. Kiev and Moscow are 6° apart in latitude, corresponding broadly to Brussels and Edinburgh, and 7° apart in longitude, a distance similar to that which separates Berlin from Königsberg. The easterly position gives Moscow a colder and longer winter than Kiev.

Further, not only is Moscow more remote from open water than Kiev, but the Muscovy of early days could only reach the sea through foreign territory. A route which left the Upper Volga at the town of Tver connected it to Novgorod, and so to the Gulf of Finland; but Novgorod was a non-Russian republic. Another route led to Smolensk, on the Upper Dnieper, whence the Western Dvina, and thus Riga, could be reached *via* Vitebsk; but Riga, again, was not Russian. From Smolensk it was also easy going, north of the Pinsk marshes, to Vilna, on a tributary of the Niemen, whence it was possible to reach either the Baltic coast, or Warsaw on the Vistula; but Vilna and Warsaw were the centres of enemy powers, and the Baltic coast was not Russian.

From the Oka, again, it was not difficult to cross to the Desna, and thus reach Kiev; but Kiev was at first within the Tartar zone and later became Lithuanian. The Volga itself led first to Kazan, and then south to the

Tartar centre of Sarai, on the left bank of the river, within the westward-pointing elbow. From this point it was easy to reach the Don, which bends towards the lower Volga, and then flows to the Sea of Azov; but all this was Tartar territory.

Not till 1553 did the English seaman, Richard Chancellor, "discover" the northern route from the Arctic Ocean. He entered the White Sea, and showed that the Northern Dvina and its western headstream, the Sukhona, afforded a means of access to the Upper Volga. The port of Archangel was founded as a result of his journey, but this northern route could only be used during the warmer season, and led through thinly-peopled lands, at first non-Russian.

This description brings out the essential facts in regard to the early Muscovy, with its Great Russian inhabitants. It was an admirable centre of internal routes, but all led to the sea through non-Russian lands. The fact that in the 16th century Tsaritsyn (now called Stalingrad), a Russian town on the right bank of the Volga functionally replaced the Tartar centre of Sarai, which disappeared, is a sufficient indication of the trend of events. Muscovy, that is, expanded by conquest along the great highways, thus becoming Imperial Russia. But the great obstacles to that expansion were not the unorganised Finnish stocks to the north or the Tartars to the south and east. The all-important exit to the Baltic was for long blocked, and the collapse of the power of the Teutonic Knights was of little importance, for the expansion of Sweden in the 17th century brought in a more formidable foe. Of greater significance, however, was the rise of Lithuania, which became united to Poland, and detached large areas of truly Russian lands.

(3) *The Rise of Greater Lithuania.* The essential points are that the Lithuanians of the Niemen Valley, thanks both to the characters of their (forested) lands and to the

presence of the Pinsk marshes, were saved from attack by the Tartars. Even before Muscovy was strong enough to resist the payment of tribute, therefore, the Lithuanians were pushing southwards, occupying lands previously Russian, and driving back the Tartars. They had received their Christianity from the west and belonged to the Catholic, not the Orthodox faith. This was a bond of union between them and the equally Catholic Poles, but increased the antagonism between them and the Russians. Before the union with Poland in the 14th century, the Lithuanian State, in addition to including the area inhabited by the Lithuanian people, extended over the region between the Upper Dnieper and the Pripyet, peopled by White Russians. By conquering Kiev and the lands down to the Black Sea coast, it came to include also the territory of the first Russia, with its Little Russian people. For a time the very existence of Muscovy seemed to be threatened by Lithuania, Smolensk, on the route between Moscow and Warsaw, being a bone of contention between the two states.

(4) *Imperial Russia*. It was inevitable then that, once fairly started on a career of expansion, Muscovy should seek not only to retake the lost Russian lands, but to include also a part of Poland with Warsaw, and Lithuania with Vilna, as a security against a possible new attack. Equally natural was the absorption of the Baltic provinces, which had been bandied about from power to power, but had never been Russian, and, much later, of Finland, which had been Swedish. The foundation of St. Petersburg by Peter the Great in 1702, as a window on the Baltic, may be regarded as the beginning of a forward western policy, intended to make Russia definitely a part of Europe. Among the difficulties which that forward policy had to face we may note that it was carried out by the Great Russians of Muscovy, for long isolated within their forested Mesopotamia, and thus out of touch with the west, and deeply influenced by their contact with the

Tartars. Again, though the peoples over whom rule was established—Poles, Lithuanians and Letts, Estonians, Finns—seemed, in varying degrees, primitive and backward in the eyes of the inhabitants of western Europe, yet they had been influenced by western culture, and had passed the stage when absorption was easy. The attempt to russify them only increased their sense of the difference between them and the Great Russians.

During the 19th century and the early years of the present one, however, Imperial Russia was a great power. The building of the Trans-Siberian Railway followed upon an extension across Asia, which was easy in the interior, but brought the antagonism of Britain, who feared for India, and of the rising power of Japan. On the European side, the railway connects Warsaw, partly by the old route, with Moscow, and then with Samara on the eastern elbow of the Volga. Here it is continued into the Trans-Siberian proper; but another line runs south-east to Turkistan (Fig. 26, p. 209).

The spread of wheat cultivation in the Ukraine, the area south and south-east of Kiev, was a response to the new demand for grain due to the industrialisation of western Europe. Industry in Russia itself made considerable progress, owing to the presence of coal (with iron) (1) in the Donets valley, the Donets being a right bank tributary of the Don, (2) in the region south and south-west of Moscow, where again iron is present, and (3) on the flank of the Urals not far from Perm, on the Kama tributary of the Volga. The Urals are rich in other minerals, including iron and platinum. Textile industries, based on home-grown flax and the cotton of Turkistan, developed especially at St. Petersburg and Moscow. The railway system of the country was also fairly extensive.

THE NEW STATES. The war and its consequences led to the disruption of this vast empire, and to something approaching an economic collapse. The greater part of the old European Russia is included in the Union of

Soviet Socialist Republics. The main element in this is the Russian Socialist Federal Soviet Republic, which also includes large Asiatic territories. Its area is given at the enormous total of $7\frac{1}{2}$ million square miles, and the population at over 100 millions. The capital is Moscow, not St. Petersburg, and this change is significant. St. Petersburg, by a process of russification, became Petrograd during the war, and is now called Leningrad. Its population has decreased and it is said to contain about $1\frac{1}{2}$ million people as against 2 millions in Moscow. The two other important republics of the union in Europe are the Ukraine, capital not Kiev, but Kharkov, on a feeder of the Donets, area about 174,000 square miles, population about 29 millions; and White Russia, capital Minsk, on a tributary of the Pripiet, area 49,000 square miles, population about 5 millions. Essentially the new Russia, so far as Europe is concerned, may be said to be Muscovy Russia plus Kievan Russia, plus certain of the conquests of the former. The displacement of the capital is an indication that the earlier aloofness from the rest of Europe has been re-acquired.

Russian Poland is now merged in the new Polish Republic (p. 92). Finland has become an independent republic, as have also Estonia and Latvia, the latter the country of the Letts. In all these three the population is predominantly Lutheran in religion, an indication of the nature of their early cultural contacts. Lithuania is also an independent republic, but great difficulty has been found in settling its boundaries as against Poland, and though in theory the historic town of Vilna is the capital, in fact that town is in Polish occupation. Poland has also certain rights to the use of the Lithuanian port of Memel.

Finland, Estonia, Latvia and Lithuania have as common characters the fact that their lands are not well-suited for crop-production, and mixed farming with the emphasis on dairying seems to offer the best prospects for the future.

Finland has a great resource in its coniferous forests (see Fig. 18), and with water-power, iron ore and good ports is making rapid progress. It has an area of 133,000 square miles, but a population of only $3\frac{1}{2}$ millions. The capital is Helsingfors (Helsinki), and Åbo and Viborg are other ports. Estonia and Latvia are small states, both as regards area and population (Estonia, area 18,000 square miles, population over one million; Latvia, area 24,000 square miles, population 2 millions), but include important ports. Reval is the capital of Estonia, Dorpat and Narva being other towns. Riga is the capital of Latvia, Libau and Windau being other ports.

For the rise of Moscow, see Vaughan Cornish, *The Great Capitals* (London, 1923). See also *The Soviet Union Year-book* (London); *Finland* (Helsinki, 1926); *Atlas of Finland* (English version) with *Text* (Helsinki, 1929); Rutter, *The New Baltic States* (London, 1925).

CHAPTER VIII

MEDITERRANEAN EUROPE AND ITS MARGINS

THE RANGE OF THE MEDITERRANEAN CLIMATE. We have regarded the Mediterranean lands as a separate natural region because within them the peculiar Mediterranean climate, with its mild, moist winters, and warm, dry summers, is widely, if discontinuously distributed. This climatic type is present also in latitudes of about 35° to 38° on the west coasts of other continental masses, as in California, Chile, the Cape of Good Hope, and southwestern Australia. This shows that it is primarily a result of position, that is, is due to the general wind circulation of the globe.

In all the regions named, however, the Mediterranean type of climate occurs over a very limited area. Its great extension round the Mediterranean Sea is due to the fact that here earth movements have occurred in recent geological time on a vast scale; that these movements have not yet entirely ceased is suggested by the frequency of earthquakes and the presence of active volcanoes (cf. Vesuvius, Etna, Stromboli). The movements have expressed themselves in two separate ways, by the rise of young folded mountains, and the sinking down of blocks of land below sea-level; and both mountains and seas affect the climate. The mountains give shelter from land influences, from cold winds in winter, and hot, excessively dry ones in summer, and cause the condensation of moisture from the sea winds of winter. The flooded areas, forming the Mediterranean Sea and its branches, carry

ocean influences far into the interior of the continental mass, and supply the winter winds with their moisture.

It is thus clear that the characteristic climate must depend on proximity both to the sea and to a mountain belt. The fold-mountains, however, do not form a complete ring round the Mediterranean Sea. In particular, the fact that they are represented on the north coast of Africa only by the Atlas chains, means that the greater part of that coast has not a Mediterranean climate, but a desert one. On the European shore the fold-mountains are all but continuous from the Andalusian Mountains of south Spain and the Pyrenees of the north to the chains which run from Greece across the islands of the *Ægean* Sea into Asia Minor, the gaps being insignificant. But other factors intervene here, so that we cannot hastily assume that the Mediterranean climate reigns supreme throughout. The mountains are folded against ancient crust-blocks, *horsts*, as they are sometimes called, which, being composed of hard rocks, determine the direction of the folds. Though some parts of these crust-blocks have sunk, others remain as elevated areas; the meseta or plateau of Spain, the similar plateau of Central Asia Minor (p. 156), the plateau of the shotts or salt lakes of Algeria, are examples, and there are others.

Because of their height above sea-level, of their relation to the marginal mountains, and often because of their extent, such plateaux tend to have an air circulation of their own, and differ notably in climate from the coastal areas. Common characters are an increase in the cold of winter, and a difference in the amount and distribution of the rainfall, which exclude typical Mediterranean crops like the olive, and the typical Mediterranean scrub forest or *maquis* which, being composed of evergreen plants, is sensitive to winter cold and wind. The place of the *maquis* tends to be taken by herbaceous plants, including grasses, so that the plateaux form pasture lands, suited, however, to sheep and goats rather than to cattle.

Other sections of the crust-blocks have sunk downwards, but only to a limited extent, so that they were rapidly silted up by the rivers flowing from the neighbouring mountains, and have become plains. Whether or not such plains display the typical Mediterranean climate depends mainly on their latitude, their relation to the sea and their extent. The plain of Andalusia (Fig. 20), widely open to the Atlantic, is one of the most truly "Mediterranean" parts of Spain, but that of Aragon, ringed round by mountains, and so cut off from the sea, is arid and cold in winter. Perhaps even more striking are the conditions in the North Italian Plains. At the base of the Alps, notably on the shores of Lakes Lugano and Como, the olive grows freely; but the plains themselves have a Central European type of climate, with cold winters, and summer as well as winter rain. At Milan slightly more rain falls during the period from April to September than from October to March—a very striking contrast with the climate of Athens or Naples (Fig. 4).

It is thus clear that while the Iberian Peninsula, Italy, Greece, Asia Minor, Syria with Palestine, the Atlas Lands (Tunisia, Algeria and Morocco) and the islands form the Mediterranean lands, these are far from uniform throughout. The islands, large and small, peninsular Italy because of its narrowness, peninsular Greece both because of its narrowness and because of the long sea-inlets, are virtually Mediterranean throughout, save that the higher mountains have a heavier rainfall than the lower grounds, and, except where it has been destroyed, are often clothed with high forest, including deciduous trees like some of the oaks and sweet chestnut, in addition to evergreens. Elsewhere Mediterranean conditions tend to be limited to coastal strips or valleys exposed to sea influences. The total rainfall tends to diminish from west to east, but is greater on coasts exposed to westerly winds blowing over a great expanse of water than on coasts facing east or exposed only to westerly winds blowing over narrow seas.

Thus on the coast of Algeria it increases from west to east, because opposite, e.g. the town of Oran, the sea is narrowed by the proximity of Spain.

THE CHARACTERISTIC CROPS AND PRODUCTS. Whether the total rainfall is considerable in relation to summer temperatures, as at Naples, or small, as at Athens and Seville, and whether the hottest months are or are not rainless, cultivated plants consist characteristically of a combination of fruit-bearing trees and short-lived herbs. This is sometimes expressed by saying that cultivation is of the garden type, with the hoe rather than the plough as its symbol.

Since, except in anomalous areas on the northern and western margins, such as the North Italian plains and the north-west of the Iberian peninsula, summer rainfall is at best small, typical trees are of the deep-rooted, water-conserving type. For the same reason, and with the same exceptions, typical herbaceous crops are those which can make their vegetative growth during the wet cool season, and be harvested before the intense drought of high summer sets in. This means that from the cultivator's point of view the heat of summer is largely wasted. It is notable also that there is an inverse relation between intensity of summer heat and summer rain. Naples, with average July and August temperatures of 75° , has nearly two inches of rain during those months. Seville, with July and August average temperatures of 85° , has practically no rain at all then. But although many of the shorter streams dry up in summer, the higher mountains, with their greater rainfall, feed perennial rivers, the water of which can be used for irrigation. Such irrigation water makes it possible to grow water-demanding plants introduced from other climatic belts. The Arabs or Moors, invaders from desert lands where all cultivation depends on artificial watering, played a great part both in laying out irrigation channels, and in introducing new plants, their influence being particularly marked in Spain and



HILLS BOUNDING THE RIFT VALLEY OF THE JORDAN RIVER, NEAR JERICHO

Note the absence of a complete vegetation cover, due to the aridity of the climate; the land yields only poor pasture.



THE "OASIS" OF VEGETATION ROUND THE POWERFUL SPRING CALLED THE FOUNTAIN OF ELISHA, NEAR JERICHO

The fruit trees and crop-plants are limited to the area which can be irrigated from the spring, the surrounding region is barren.

Sicily. Irrigation was, however, carried on before their invasion, and has made much progress in recent times. But the areas within which it can be, or need be, carried on on any scale are not large, and broadly it may be said that, in contrast to the desert areas to the south and east, cultivation is nowhere wholly dependent upon it, even if the cultivators everywhere adopt simple methods of conserving the water furnished by the rainfall.

Wheat, vine and olive are always grown without added water. Of these the olive, with its small, silvery, ever-green leaves and its slow-ripening, oily fruit, is peculiarly fitted to the Mediterranean type of climate, and is scarcely grown on a commercial scale outside its range (Plate V). The vine, a deciduous, climbing shrub, with long roots, is not limited to Mediterranean Lands, but grows there with great freedom.

There are many other fruit-bearing trees which will thrive in the regions having a fairly high total rainfall, even if they may also be grown elsewhere on irrigated land. Among these are fig, carob or locust-bean, apricot, pomegranate, almond. Figs and apricots are readily dried in the sun and thus preserved, and the others named are coated fruits easily kept and transported. Similarly there are many herbaceous plants which can generally be grown with the natural rainfall, even if the cultivator may find it advantageous to supply stored water if the showers do not come at suitable intervals, or may use the plants to fill up spaces on lands irrigated primarily for more valuable crops. Among these are pulses (peas, beans, etc.) very important as a source of proteid in lands where meat is scarce, flavouring substances like onions and garlic, used to correct the tastelessness of much vegetable food, with salads and green vegetables of all sorts.

Very different are the crops which quite definitely require water in the hotter season. We are apt to think of the citrus fruits (the various kinds of oranges, lemons,

citrons) as typically Mediterranean. But all are very sensitive to frost and are thus limited to the warmer parts, and in these the rainfall is not as a rule sufficient to permit of the swelling of the juicy fruit, so that they are usually grown on watered lands. Rice (North Italy and Spain and to a small extent Southern France), sugar cane (Spain), cotton (now hardly grown except in Asia Minor and Greek Macedonia), bananas (Algeria and also south Spain) are other examples of these alien crops which need more water than falls from the skies. The date palm, grown in groves at Elche on the south-eastern coast of Spain, and in scattered specimens nearly everywhere, is even more of an intruder. The dates ripen at Elche, but the tree generally is grown within the Mediterranean area proper mainly for its leaves, much used for decorative purposes.

A third group of plants cultivated within the Mediterranean area includes those which need summer moisture without being very exigent in the matter of temperature. One of these is maize, grown where summer rainfall is heavy (north-western Spain, North Italy, where it becomes the bread plant), and also on a smaller scale on irrigated or naturally flooded lands. To this group also belongs the mulberry, grown extensively in North Italy, and to a smaller extent in Spain, there chiefly on irrigated land. The mulberry is a deciduous tree with thin leaves, by origin a Chinese or summer-rain tree. Since it is grown for feeding silkworms a mass of young foliage is important, and this is best obtained by liberal supplies of water. The North Italian plains, with their fairly heavy rainfall, have thus an advantage over other areas in the matter of silk production. The fact that they are Central European rather than Mediterranean in climate is indicated by a number of other crops, such as sugar beet, flax mainly for seed rather than for fibre, hemp and so forth.

All the plants so far named are cultivated in the sense

that they differ widely from their known or supposed wild progenitors. A considerable number of wild plants are also utilised and are sometimes planted on tilled ground. Thus the cork oak, grown especially in north-western Spain and in Portugal, has great importance in connection with the wine industry. Alfa (esparto) grass, which covers vast tracts in Spain and the Atlas Lands, has always been of importance as supplying material for baskets and hampers as well as cords. Recently it has become valuable as a paper-making substance and is largely exported. Tanning and dyeing materials are extracted from many kinds of trees and shrubs, a fact related to the development of the leather industry in those parts where goats are reared extensively. Sumach shrubs are much cultivated in Sicily for this purpose, while Asia Minor exports, under the name of valonia, acorn cups which form a source of tannin. Many of the plants and shrubs of the maquis are rich in scented oils, resins, gums, etc., which apparently help them to resist summer drought, and some of these are utilised in commerce, if on a comparatively small scale. Mention may be made of rosemary, sage, bay laurel and wild pyrethrum, all exported from Dalmatia, the last forming the basis of insect powder. The widely-distributed mastie tree yields a gum, collected especially in some of the Greek islands. The main interest of such products is the way they emphasise the semi-arid conditions, for gums and resins are mainly produced in desert lands.

The Mediterranean Sea is rich in fish, though these are not generally such good eating as those of the North Sea and Atlantic, and sponges and coral are also obtained.

TRADE AND EXPORTS. The intensive type of cultivation described, carried on mainly without elaborate irrigation, means that the land can support a considerable agricultural population, and yields a variety of products, including many which in the eyes of the inhabitants of other parts of Europe are luxuries. The variety of pro-

ducts, combined with the ease of communication over the sea, goes far to explain the early rise of civilised communities here, while the ruins of the magnificent buildings constructed by those early communities, and the luxuriant and unfamiliar vegetation, give an impression of great natural wealth. But though to the more northerly peoples, as well as to those from the deserts to the south and east, the Mediterranean Lands have seemed a veritable paradise, they are in reality to-day poor and sometimes overcrowded.

The general absence of coal has made the development of modern large-scale industry difficult, a striking difference from western and parts of central Europe, and both climate and relief make the export of bulky agricultural products, like the wheat of Russia, impossible. Nor are there forests of sufficient extent to permit of the export of timber, so important a source of wealth to the lands of the north of Europe. Spain is richly mineralised, and certain mineral products occur elsewhere, but as a whole the Mediterranean Lands have no great source of wealth in the sub-soil.

The most characteristic exports are the products of the intensive cultivation, particularly of fruit trees, the products being frequently worked up in some way before being sent out. Olive oil and preserved olives formed commodities in regard to which the region had no competitors till the comparatively recent introduction of the tree as a commercial crop into other lands of Mediterranean climate, particularly California. The wines, on the other hand, especially in Italy, and even more markedly in Greece, are as a rule less valuable than those of extra-Mediterranean France, which are more carefully prepared, and keep better (p. 29). It is curious to note also that while dried grapes, such as the raisins of Spain, the currants of Greece (mainly produced in the Ionian Islands and on the western side of the mainland, but exported from the shores of the Gulf of Corinth,

currant being a corruption of Corinth), and the sultanates of Asia Minor, had no competitors till the recent development of the Californian and Australian dried fruit trade, the fresh grapes of south-eastern Spain and Portugal command lower prices than those grown with or without protection in the lands further north. Figs form a somewhat analogous case. The dried figs of Asia Minor (Smyrna) are—or were—unique, though great efforts have been made to produce the same type in California, but the fresh figs of Mediterranean Lands are not comparable to those grown under glass elsewhere.

Oranges, especially from Spain and Portugal, the Atlas Lands and Palestine, lemons, especially from Sicily, and other citrus fruits have always been important, because the Mediterranean Lands form the nearest source of supply for the rest of Europe. Competition from other areas is, however, now severe, particularly as these fruits can be grown on irrigated lands (Southern California, Australia, South Africa); in areas with a considerable summer rainfall, such as Florida; and in many sub-tropical and tropical islands.

Silk, since the introduction of the silkworm and the mulberry from the east, has been very important, but here the competition from China and Japan is severe, for the rearing of the silkworms demands much patient and cheap labour. North Italy is much the largest producer of raw silk in the Mediterranean area, but silk manufacture there lags behind that of France, and much silk is exported in the form of yarn to be manufactured elsewhere. In addition to the plaited esparto or alfa of Spain and the Atlas Lands, straw hats and straw plait are exported extensively from Italy where, especially in Tuscany, wheat is sown very thickly in spring to obtain the lanky stems used.

In Italy, the most densely peopled of the Mediterranean Lands, and the only one containing large territories which share the economic life of Central Europe, as they do also

its climate and products, great efforts are being made to develop hydro-electric power as a substitute for imported coal. North Italy has a considerable development of manufactures, including both textiles and various branches of the iron industry, especially motor-cars (Turin). Barcelona in Spain is also a modern manufacturing town, contrasting as notably with the cities of the rest of the country, as do centres like Turin and Milan with those of peninsular Italy. Elsewhere large-scale industry has hardly developed, and in the Atlas Lands and Syria in the larger sense the arts and crafts of an earlier world still linger little altered.

SPAIN AND PORTUGAL. The essential facts of structure are shown in Fig. 20. The meseta covers a large part of the surface and has everywhere steep edges, and includes uplifted areas, often presenting the appearance of jagged mountain chains (sierras). A belt of such high land, the mountains of Castile, forms the main water-parting, and north-west and south-east of these are areas in which the older rocks are covered by a thick mantle of younger (Tertiary) beds. These constitute the high plains of Old and New Castile, which are more or less steppe-like and mainly devoted to wheat cultivation and sheep-rearing; the former predominates in Old Castile, with Valladolid as its centre, the latter in the drier New Castile. The merino sheep, with its fine fleece, was brought here from the Atlas Lands by the Moors, and Spain served as its centre of dispersion to other lands. From the point of view of world commerce, however, the wool production of Spain is now insignificant.

Of the two series of fold-mountains the northern is the Cantabro-Pyrenean belt, continued into the mountains of Catalonia, and separated from the plateau by the plain of Aragon, crossed by the Ebro. The southern series is formed by the Andalusian mountains, with the Sierra Nevada as the chief element. The Andalusian plain, watered by the Guadalquivir, is the southern counterpart

of that of Aragon, but differs in being open towards the Atlantic, and thus Africa, while the latter is shut off alike from the Mediterranean and the Bay of Biscay. It was from Africa that the Moors or Arabs entered Andalusia in the 8th century. At the time of their greatest extension they occupied the peninsula except for its north-western part, so different in its climate, with copious summer rainfall, in its natural vegetation, with woods containing deciduous trees, and in its high and complex relief from the plateaux and river valleys in which the Arab modes of life could best be practised. This area served as a centre for the re-conquest of the rest of the peninsula. The frontier of the Frankish Empire also overlapped the Pyrenees, and kept a part of north-eastern Spain Christian. The last stronghold of the Moors in Spain was Granada, not captured till the end of the 15th century.

Apart from the valley plains of the Ebro and the Guadalquivir the only lowlands of any extent are found on the coasts of Portugal and of Valencia and Murcia in south-eastern Spain. The last, in an area of low rainfall, are irrigated by help of the coastal streams, particularly the Guadalaviar, Jucar and Segura, and form the *huertas*, or watered gardens, with their multiplicity of crops. Irrigation is also practised round Granada, the Jenil tributary of the Guadalquivir, fed by the snows of the Sierra Nevada, being used, and in Aragon, where the water of the Ebro is the agent employed.

Of the rich mineral deposits the iron ores deserve special note as they enter largely into external trade. Iron ores occur at a number of points along the north coast, being exported mainly from Bilbao and Santander ; also along the south-east coast, where Cartagena serves as one exit. Coal is present but is not very extensively worked because it tends to occur in inaccessible situations. The chief mines are at Oviedo in the north, with Gijon as the port. Silver and lead are found at Linares, on the south slopes of the Sierra Morena, and also on the south-

east coast, with Almeria as the outlet. Important copper mines occur in the Rio Tinto region, with Huelva at the mouth of the Rio Tinto as port. Quicksilver is mined at Almaden, north of the Sierra Morena.

Madrid is placed on the Manzanares, a small feeder of

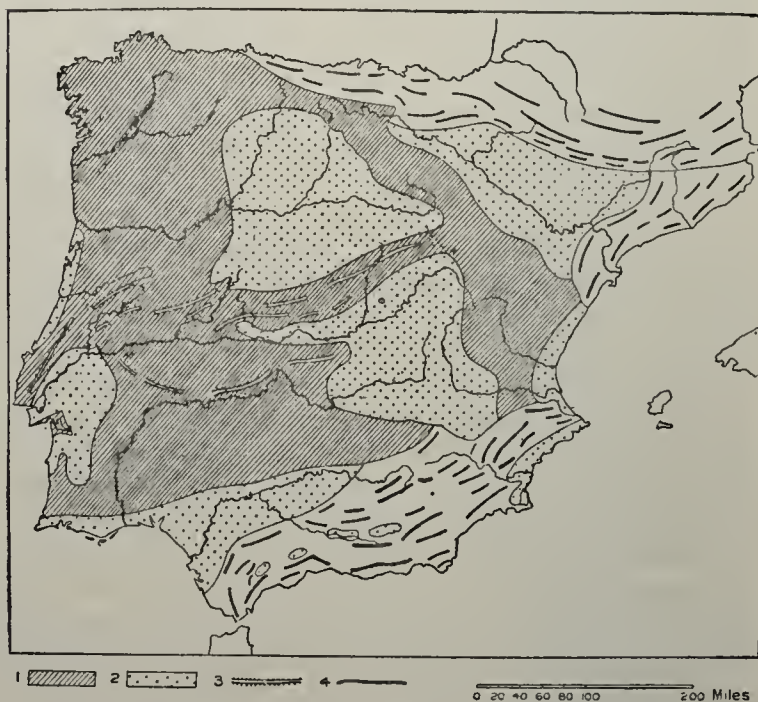


FIG. 20.—STRUCTURE AND RELIEF OF THE IBERIAN PENINSULA.

1. Plateau areas, the ancient rocks of the meseta being exposed to the west and centre, while the eastern part of the plateau is built of younger rocks; 2. The Tertiary plains and basins; 3. The elevated parts of the meseta, giving rise to the central Sierras; 4. The young fold-mountains.

the Tagus, in the centre of the meseta. As capital it dates only from 1561, and like Moscow, in Russia, represents the result of a series of experiments undertaken with a view to finding a suitable centre from which to rule very diverse territories. There is indeed not a little analogy between the historical geography of Spain and Russia,

both countries having to struggle against invaders, and being much modified in the course of the struggle. But the Moors, who introduced elaborate systems of irrigation, new crop plants and various arts and crafts, and had a highly developed intellectual life, were very different from the Tartars.

Barcelona is the outlet of the plain of Aragon as well as of its own province of Catalonia, but lies well to the north-east of the Ebro mouth, the river bringing down too much silt to permit of a large port being established there. Seville, though 70 miles up the Guadalquivir, can be reached by ocean-going steamers. Cadiz, on a bay south of the river mouth, is less important as a port of call than Gibraltar, which has a good harbour and is a coaling station. Valencia, at the mouth of the Guadalaviar, is the port of the productive irrigated lands of the south-east.

Spain has a total area, without the islands, of 190,000 square miles, and a population of about 22 millions, not very much more than half that of Italy. The density is only about one-third of that of Italy. Madrid, the capital, and Barcelona, the commercial capital and chief seaport, have populations of the order of three-quarters of a million, Barcelona being rather smaller than Madrid. The only other towns with populations of over 200,000 are Valencia and Seville.

Portugal, with an area of 34,000 square miles and a population of $5\frac{1}{2}$ millions, is a small state. Lisbon, the capital and a port, contains half a million people. Oporto, with its outport of Leixoes, is the only other important town. The population of Portugal is mainly agricultural, and the percentage of illiterates is much higher than in Spain, being stated to reach 80 per cent. of the total. Wines, cork and sardines in oil are important exports; the mineral wealth is considerable, but little developed.

ITALY differs markedly from Spain in its central position, both as regards the lands of Central Europe and the Mediterranean Sea. Though it is ringed round by the Alps to the north, these are crossed by many passes, and the great railway routes traversing the Mount Cenis, Simplon, St. Gothard (Fig. 14), Brenner and Semmering converge

on North Italy. Italy forms also the boundary between the eastern and western basins of the Mediterranean Sea, and all the seaways from east to west pass some part of the Italian coast. Thus the Italian ports are points where sea routes meet some of the most important land routes of Europe; this made many of them great centres of mediæval trade. The discovery of the seaway to India, and of America, with all the associated political and economic changes, led to the collapse of this trade. Modern Italy is of very recent origin, and when as a unified state it awoke to the new possibilities resulting from the opening of the Suez Canal and the development of world commerce, it was to find rival powers established on the shores of the Mediterranean. Thus the ancient port of Genoa suffers from the competition of Marseille, that of Venice is less suited to present-day steamer traffic than Trieste, which is, however, now like Fiume, Italian.

Again, though the pressure of population is much greater than in France, it is France and not Italy which holds the protectorate over Tunisia and occupies Algeria. Italy annexed Tripoli (Italian Libia) in 1912, but this is a poor and barren land compared with French North Africa. British control of Gibraltar, Malta and the Suez Canal means that the west to east route across the Mediterranean is not Italian as it was once Roman, nor has Italy eastern stations in the sense that the republics of Genoa and Venice had, even if she occupies Rhodes and other smaller islands (the Dodecanese) off Asia Minor.

As compared with Spain, Italy has a much more northerly position. Milan, the largest city, is in a slightly higher latitude than the French town of Bordeaux, Rome than Barcelona. The parallel of 40° practically bisects Spain, while of the provinces of peninsular Italy only Calabria and a small part of Apulia lie south of this line. This is the result of the north-west to south-east trend of Italy, which leads to Turin in Piedmont being 10° of longitude west of Brindisi in Apulia. This is practically

the same longitudinal difference as that which obtains in Spain between Vigo in Galicia and Barcelona in Catalonia, despite the great difference in the breadths of the two peninsulas. One result is to make the Adriatic Sea very narrow, especially at its southern end (Strait of Otranto, about 50 miles). Till the collapse of Austria-Hungary at the end of the war, that power was not only firmly established on the eastern shore of the Adriatic, but also extended far down the Adige valley.

If, therefore, Spain is peculiarly aloof from mainland Europe, to which it is linked mainly by railways at either end of the Pyrenees, Italy, despite the apparent barriers of the Alps and the Adriatic Sea, is closely linked to it. While to the north, Switzerland forms a convenient buffer state, to the north-east and east the collapse of Austria-Hungary and of Turkey as a European power has brought new and not yet wholly solved problems.

Italy may be regarded as divided into four natural regions, (1) the northern plains with their mountain rim, (2) Central Italy, (3) Southern Italy, (4) the islands.

To the north and west the northern plains are bounded by the Alps, and these pass into the Apennines. The division between the two is taken as the Altare pass, a gap through which runs the railway from Turin to Savona. The plains are drained for the most part by the river Po, but eastward a few streams, such as the Adige, Brenta, Piave, etc., reach the Adriatic independently. The coast is very liable to silting, and the fact that Venice lies well to the north of the delta of the Po should be noted. In its plain course the Po is liable to flooding and its neighbourhood affords a dangerous site for towns. Thus while Turin is on the river, Milan (silk goods and cutlery) is one of the few large inland towns of the world not placed on a great river. As well as the crops already named, the plains produce fine pasture and forage crops, often on irrigated land. North Italy thus differs strikingly from the Mediterranean world in general in the great development of the

dairying industry. Minerals are scanty, as they are in Italy generally as compared with Spain.

Central Italy may be said to extend to the Campania plain round Naples. It has a cooler climate than the south, so that citrus fruits are absent; the Apennines swing to the north-east, so that plains, such as those watered by the Arno and the Tiber, are fairly extensive; the people also have a northern strain, even if this is less marked than in the plains. Rome, the third city, being surpassed in size by both Milan and Naples, owes its selection as capital both to its historic prestige and to its central position.

In Southern Italy the Apennines approach the western coast, so that south of the Campania such plains as there are lie on the Adriatic side. In Apulia the large flocks of sheep and the extensive cultivation of wheat recall the plains of Castile, while on the moister Tyrrhenian coast oranges and lemons are produced. Naples is the centre of an exceedingly productive area and an important port.

The islands contain most of the limited mineral resources of Italy, sulphur being obtained in Sicily, iron in Elba, and zinc and lead, with other ores, in the large island of Sardinia, which is, however, comparatively thinly peopled, and much subject to malaria. Sicily is exceedingly fertile, Palermo and Catania ranking among the large towns of the kingdom.

Italy has a total area of 120,000 square miles, and a population of 40½ millions. Milan, Naples and Rome all have populations exceeding three-quarters of a million, and eight others have populations exceeding 200,000, several of them being inland towns, a striking contrast with Spain.

GREECE, which has now an area of 50,000 square miles, obtained a large extension of territory as the result of the Balkan wars, and, in addition to the peninsula, the large island of Crete, and the Ægean islands, now includes a large stretch of territory on the north shore of the Ægean. As against this, however, Greeks have practically disappeared from Asia Minor, and the large refugee population,



TOBACCO LEAVES ON THE WALLS OF A NATIVE INN IN ALBANIA

Tobacco, often of high quality, is grown extensively in Albania, Bulgaria, and parts of Greece. Though summer drought may make irrigation necessary (contrast conditions in U.S.A.), it permits sun-drying to be carried on.

Photo by Bertram Christian.



OLIVE GROVES ON THE ITALIAN RIVIERA, EAST
OF GENOA

The bushes in the wall are figs



amounting to a million and a quarter, has been settled in the new lands. Owing to the absence both of coal and water-power there are practically no large-scale industries, but the Greeks are keen traders, and most of the sea traffic of the Eastern Mediterranean is in their hands. The total population is now some 6 millions. Athens, with its port, the Piræus, is a large city of modern type, now linked to the railway system of Europe generally. Salonika is the only other large town, but has a considerable non-Greek (especially Jewish) element.

The whole of ASIA MINOR is included in Turkey, a state which has undergone great changes in recent years. Its area is estimated at 500,000 square miles and its population, at the census of 1927, was about $13\frac{3}{4}$ millions. The Christian population, Greek and Armenian, has now virtually disappeared, and it is believed that this is likely to affect the amount of those products, such as olive oil and silk, which demand delicate manipulation. Many of the minor industries also, such as carpet-making, fig-packing and so on, were mainly carried on by the Christians. Asia Minor is very rich in minerals, including some coal, but these are little worked. Copper is one of the most important.

SYRIA is mandated to France under the League of Nations and PALESTINE to Britain. Cyprus, with a large Greek but a considerable Turkish population, is a British colony.

Of the Atlas lands, TUNISIA and ALGERIA have been already mentioned. Both show much resemblance in climate and products to southern Spain, and Tunisia produces olive oil (p. 30), dates and esparto grass in large amounts. The minerals include phosphates (Tunisia), and zinc and iron ores. Morocco is interesting in that it is for the most part a French protectorate, the Spanish zone being small. There is also an inter-

national zone round the port of Tangier. The French are doing much to develop the country, and a certain amount of French settlement has taken place. There are several ports on the Atlantic coast, Casablanca being well equipped.

See Newbigin, The Mediterranean Lands (London, 1924).

PART II
ASIA

CHAPTER IX

GENERAL SURVEY OF ASIA

POSITION. Asia, the largest of the continents, lies mainly in temperate latitudes. The Tropic of Cancer crosses the three great southern peninsulas of Arabia, India and Further India, and skirts the extreme south of China proper; a northern coastal strip extends beyond the Arctic Circle; but the mass of the continent lies well within these limits. Tomsk, in the heart of Siberia, is in the same latitude as Edinburgh, Peking is in that of Madrid. In position Asia resembles North America where only part of Mexico with Central America extends into tropical latitudes. Peking corresponds to Philadelphia, Shanghai to New Orleans. The three southern continents, on the other hand, have not only great extension in the inter-tropical belt, but Africa and mainland Australia do not reach 40° south latitude, and only a very narrow part of South America extends beyond 50° south.

STRUCTURE AND RELIEF. We have already seen that Europe is but a western peninsular prolongation of Asia. If we call this greater continental mass Eurasia, we find that it possesses one unique feature. This is that it is traversed by a great series of fold mountains of Tertiary age, that is geologically young, showing a general west-to-east direction. The corresponding mountains in the Americas have a general north-to-south direction, and Africa and Australia have no mountain belt of similar characters.

The build of Asia is very complicated, and the details have not yet been worked out fully; but the presence of

the folded mountain belt is the essential feature. In harmony with the greater size of the continent as compared with Europe, we find that within it the mountains possess certain special features. In Europe and on its margins the chains are not perfectly continuous, because of the sinking of blocks of land beneath the sea: thus the Pyrenees are separated from the Alps; the Atlas Mountains from the mountains of Sicily and the Apennines of Italy; the Dinaric Alps of Greece from the mountains of the islands and of Asia Minor; the Balkan Mountains from the mountains of the Crimea and from the Caucasus. No such breaks of continuity occur in Continental Asia. From the Taurus of southern Asia Minor to the eastern end of the Himalayas and their continuations there is an uninterrupted series of earth crumples. This continuity is associated both with a greater elevation, the highest mountains on the face of the earth being found in the Himalaya, and with the greater width of the folded belt.

Further, the belt shows a curious alternation of swellings and constrictions. Beginning in the west we find that the Taurus Mountains in Asia Minor are widely separated from the Pontic Mountains, the two bounding the plateau of Anatolia. These chains, together with the Caucasus, converge towards the Armenian mountain knot. A new divergence follows, giving rise to the great plateau of Iran, beyond which is the knot of the Hindu Kush. To the east lies the Plateau of Tibet, with its bounding mountain chains. This, the structural equivalent of the Iran plateau, reaches a much greater elevation, with correspondingly loftier bounding mountain chains. Eastward the more northerly chains are continued into Western China, while the more southerly bend southwards to enter Further India.

South-west of the Iran plateau on the one hand, and south-east of it and south of the Tibetan one on the other, are two hollows which have been wholly or partially filled up by the waste of the mountains to form great river

plains. These hollows form (1) Irak, or Mesopotamia in the larger sense, and (2) the Indo-Gangetic plains. The second has been completely filled up by alluvium, giving rise to a crescent-shaped belt of plains extending from the mouth of the Indus in the Arabian Sea to that of the Ganges in the Bay of Bengal. The alluvial filling in the case of Irak is much less complete, as is shown by the presence of the Persian Gulf. But even in historic times, as we know by the position of former ports, the united Tigris and Euphrates have pushed their deltaic deposits outwards into what was once the head of the Gulf, so that we may think of it as in the act of being silted up. Similarly, we can look back in imagination to a time when the great rivers had not yet begun their transporting work, and a belt of sea separated the Himalayas from peninsular India, and an enormously enlarged Persian Gulf intervened between Western Persia and Armenia on the one hand, and the peninsula of Arabia on the other.

These two peninsulas, indeed, are strikingly different from continental Asia. That Arabia is but a fragment of Africa, incompletely separated by the deep but narrow Red Sea, is perhaps obvious. The belief that peninsular India, or the Deccan in the larger sense, was once united to a greater Africa is based chiefly on geological evidence. The fact that, like a large part of Africa, it is an old crust-block, forming a tableland with steep sea edges, the Western and Eastern Ghats, and a fairly steep drop to the northern plains, is of much geographical importance.

This description gives us a general notion of the structure of the southern part of Asia. It is traversed by a belt of mountain folds, taking the form of gigantic beads separated by great knots, the two great plateaus of Iran and Tibet forming the chief of the "beads." These plateaus are margined by alluvial plains which link the Asiatic mainland to the crust-blocks of Arabia and peninsular India.

The mass of the mainland lies north of the broad belt

of folding. We may think of it as corresponding—with an enormous difference in size—to the part of Europe which extends north and north-west of the Alpine fold system. Here, as in Europe, we have a combination of plains and ancient uplands, with the difference that in Asia the plains lie to the west and the uplands to the east. The greatest area of continuous plain is that which extends from the Ural Mountains eastward to the Yenisei river and forms Western Siberia, which is but a continuation of the plains of Eastern Europe. Beyond the Yenisei the plains stretch along the coast in a wide tundra belt, but further inland they give place to broken country, becoming more and more mountainous to the east in the dissected plateau areas called the Yablonoi and Stanovoi Mountains.

The plains of Western Siberia are separated from another lowland area to the south by a low swelling, which reaches its greatest height just north of Lake Balkhash. This second lowland, or Turan, bears the Aral Sea on its surface, and consists of steppe and steppe-desert. Round the north end of the Caspian Sea it is continuous with the semi-deserts of European Russia (p. 122). To the south and south-east of Turan offshoots of the fold mountains, starting from the Hindu Kush knot as the Pamirs and continued into the Tien Shan Mountains, help to define the Tarim basin, another desert area, resembling Turan but lying at a higher level (Fig. 27). North-east of the Tarim basin is the great plateau of Mongolia, with the Gobi desert, structurally a part of the eastern Siberian tableland, as is also the much more dissected plateau of Manchuria, still further east. China proper is a region of complicated structure, the essential geographical feature of which is the presence of great fertile river valleys.

Finally, as is shown by the rows of volcanoes and the frequency of earthquakes, the whole of the east coast of Asia is an area where extensive fractures have taken place,

with the sinking of great blocks of land, and the persistence of long chains of mountainous islands bounding the seas formed by the subsidence. This extraordinary series of marginal seas consists first of the Bering Sea, bounded by the Aleutian Islands, which extend from the peninsula of Alaska towards that of Kamchatka. Then comes the Sea of Okhotsk, bounded by the festoon of the Kurile Islands. These are continued into the main Japanese archipelago, which bounds the Sea of Japan. The East China Sea has a less complete boundary in the small Luchu Islands and Formosa, while the South China Sea is margined by the Philippines, which continue the line of Formosa. Further south the large islands of the Malay archipelago bound other, less important, seas.

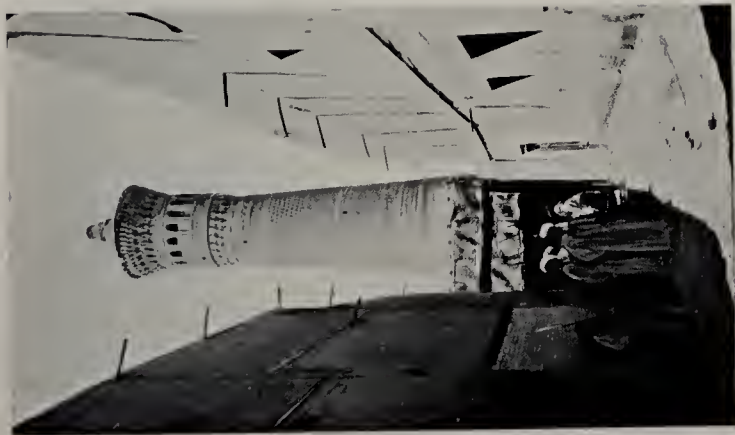
NATURAL REGIONS. We shall not attempt to divide Asia into natural regions in anything like the detail given in the case of Europe ; but some broad contrasts between the different parts must be noted. The most fundamental of these is climatic, and climatic conditions in Asia are greatly influenced by the size of the continent and by the transverse direction of the mountain chains. Owing to the great area, places in the interior may be as much as over 1,500 miles from the sea, and are thus " continental " in a sense very different from the meaning of the term in Europe. The central mountains and plateaus also act as barriers to warm influences from the south, and increase the continentality of the interior. As a result we find that inland Asia is characterised by the severity of the winters, which reaches its maximum in north-eastern Siberia, and also by the generally low preeipitation, which is in many areas insufficient for crop production.

A further consequence of the size and of the nature of the relief is the intensity of the winter high pressure system of the interior, this centring over the Gobi desert. In summer, on the other hand, as the land heats up, an intense low pressure system develops over Baluchistan and Sind, and spreads to the north-east throughout the

greater part of the continent. The pressure changes bring about a complete seasonal—or monsoonal—reversal of the winds over large areas, the winds being inflowing in summer and outflowing in winter. This periodic change is particularly marked in the seas round India, where it was of great importance in the days of sailing vessels. Navigators of these seas early learnt that the summer winds would bring them to this land of spices, silks, precious stones and other treasures, while the cool season winds would enable to depart with their cargoes. The term monsoon has its origin in this fact, but is now used in a much wider sense to indicate any seasonal reversal of wind direction. Geographically it is of much greater importance to realise that the summer winds, blowing from sea to land, bring to certain parts of southern and eastern Asia downpours of rain which permit the summer heat to be utilised fully for crop production. Thus, while a very large part of Asia has insufficient precipitation for crops, the lands fully exposed to monsoonal winds tend to have rainfall enough to allow of large-scale production with a correlated high density of population.

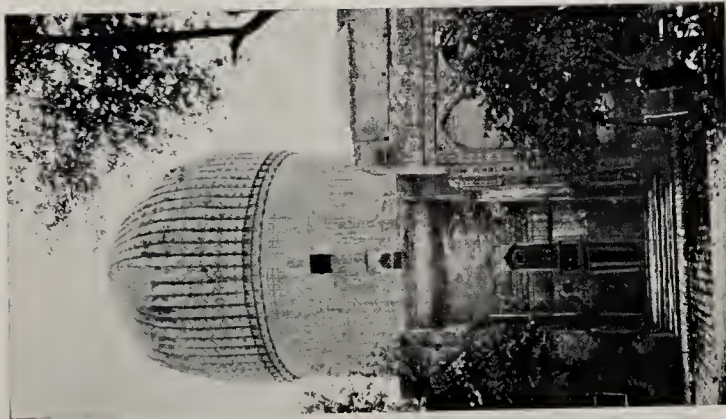
The area receiving monsoon rains includes the south-western corner of Arabia, the whole of India, Further India, China, Korea and the Japanese archipelago, and extends also to Manchuria and even to the western side of the Kamchatka peninsula. But to the south-west and to the north-east alike the duration of the rains is short (under five months), and it is usual to regard only India, Further India, China and Japan as monsoon lands. We thus obtain our first great region, the Monsoon Belt.

To the north-west of it, extending from Arabia to Mongolia, lies a great belt of deserts, steppes and mountains, where the precipitation is mostly too low to permit of rainfall crops, and the elevation may be such as to make winter temperatures very low. But while vast areas are suited only for pastoral occupations, irrigation water is obtainable in abundance elsewhere, and oases



A STREET IN BUKHARA RUSSIAN
TURKISTAN

The blue-tiled minaret in the background, which reaches a height of over 200 feet, formerly served as a place of execution, criminals being flung from its summit.



THE TOMB OF TIMUR OR TAMERLANE
AT SAMARKAND

Samarkand was the capital of the great empire established by the Mongol conqueror Timur, and is remarkable for the beauty of its buildings.

Photos by Miss Ella Christie.

of intensive cultivation break the monotony. Such watered areas, as in Mesopotamia, parts of Persia, parts of Western Turkistan (Turan), the Tarim Basin, or Eastern Turkistan, have at various times nourished highly civilised communities, but historically this belt as a whole has been a region of instability. Not only has it seen the rise and fall of highly developed states within favoured areas, but its inhabitants have always been a menace to the more stable communities of the monsoon lands to the south-east, and to those of Europe and of the non-European Mediterranean Lands to the west. Only comparatively small and sharply localised parts can support any density of population, and the inhabitants of the drier areas, usually migratory like their flocks, are always tending to increase more rapidly than their resources, and in the past have periodically swarmed outwards to more productive lands.

To the north of this zone lies the third region, that of the Grasslands, Forests and Tundra. The coniferous forest of Eastern Europe (p. 122) is continued right across Siberia, where it forms the taiga. In the west the taiga gives place southwards to grasslands, separated from the semi-deserts and deserts of Turan by the low Semi-palatinsk plateau north of Lake Balkhash (p. 158). In Eastern Siberia these grasslands occur only on a much smaller scale, the relief bringing the taiga much nearer to the steppe-desert of Mongolia. Northwards the taiga is fringed by a wide tundra belt. Until Russian penetration began, especially during the 19th century, the region was sparsely inhabited, mainly by primitive peoples at the hunting and collecting stage of culture, the reindeer being the chief domesticated animal in the north.

Leaving out the Mediterranean Lands of the south-west, we can thus recognise three broad zones or regions in Asia. These are (1) the Monsoon Lands with their dense population of cultivators; (2) the Desert and Mountain Belt with limited cultivation dependent chiefly

on irrigation and with great areas occupied by pastoral peoples; (3) the Grassland, Forest and Tundra Belt, with a native population mostly of primitive folk and a

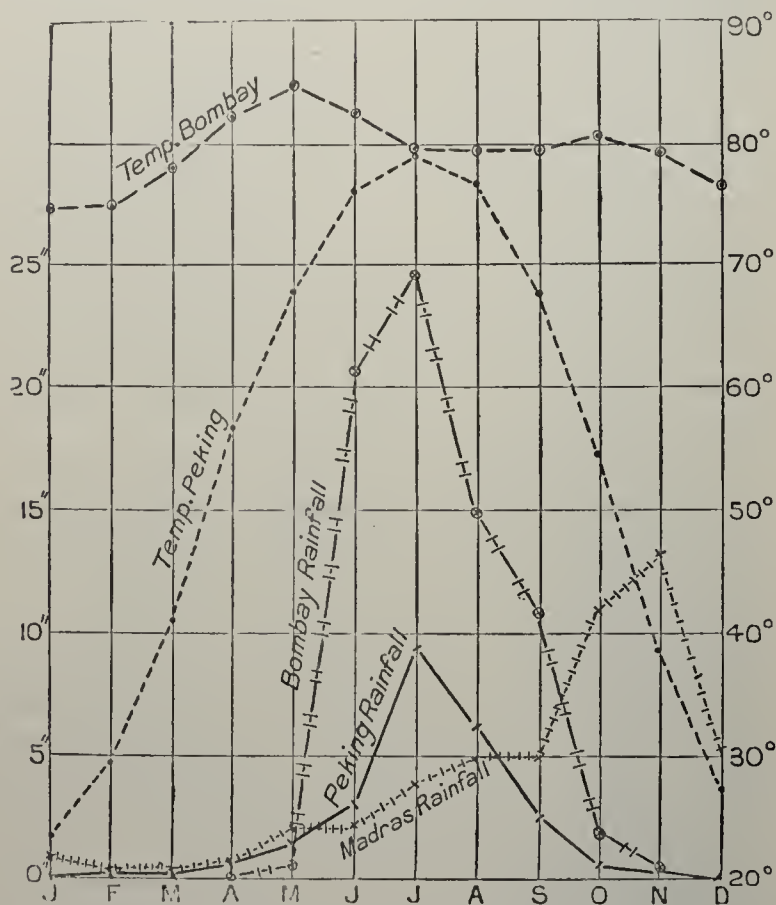


FIG. 21.—MEAN TEMPERATURE AND RAINFALL AT PEKING AND BOMBAY, AND RAINFALL AT MADRAS.

superimposed European element mainly in the grassland areas.

THE CLIMATES OF THE THREE ZONES. Climatically, the most important feature of Asia is the great extension

of monsoonal conditions there. In no other continent does this climatic type occur over so wide an area or in so pronounced a form. It is here, therefore, that it can best be studied.

The first point to note is that by definition a land of monsoonal climate is one in which rain-bearing ocean winds prevail during some part of the warmer season, and drier land winds of a contrary direction during the cooler season. The temperature conditions, that is to say, form no part of the definition. We tend, it is true, to think of monsoonal climates as warm, but this is largely because India is the most familiar monsoon land. In India there is no really cold season, save at great elevations, but over large parts of China the winters are so severe as to limit crop production to certain months of the year only. At

TABLE VII

TEMPERATURE AND RAINFALL CONDITIONS AT REPRESENTATIVE STATIONS IN CHINA AND INDIA.

Station.	Mean temperatures.		Total rainfall.	% in summer 3 months.	% in winter. 3 months.
	Hottest month.	Coldest month.			
Peking ..	78·8 July	23·5 Jan.	24·9	75	nil
Bombay ..	84·6 May	74·5 Jan.	74·0	81	nil
Hongkong..	81·7 July	57·7 Feb.	90·2	52	nearly 4
Lahore ..	93·0 June	53·0 Jan.	20·7	65	12

Temperatures are in degrees Fahrenheit and rainfall in inches.

the same time, North China has a perfectly typical monsoonal rainfall. A comparison between Peking and Bombay (Fig. 21 and Table VII) is very instructive in illustrating this point of similarity of rainfall distribution combined with great difference in temperature range.

Bombay is in latitude 19° north and thus 21° south of Peking (latitude 40°). The height of the two stations

above sea-level shows no great difference, being 37 feet at the former and 131 feet at the latter, but, apart altogether from latitude, Bombay, on an island on the west coast of India, has a very different position from Peking, in the east of China, some 100 miles from the shores of an almost land-locked gulf. These contrasts of position affect both the amount of rainfall and the range of temperature, and make the similarity of the distribution of rainfall all the more striking. It will be noted that both stations have at least three-quarters of their total rainfall in the period from June to August, while no appreciable percentage of the total falls in the period from December to February. Their July temperatures are almost the same, the hottest month at Bombay being May, before the rains begin in earnest. In January, however, Peking is 51° colder than Bombay, and has a temperature remarkably low for its latitude.

Bombay may be regarded as exemplifying the typical tropical monsoon climate of India, Peking the typical temperate monsoon one of North China. A study of other stations brings out in the first place the fact that the abnormal winter cold of Peking is not an isolated fact, but that it is generally true that, in relation to latitude, the winter temperatures in China (as in Japan) are notably lower than those in India. This is due to the protection given to India by the central mountain belt, which acts as a barrier to cold winds, while China, especially in the north, is exposed to continental influences. Further, both in India and in China, deviations from the typical monsoonal rainfall distribution are frequent. In some cases, as at Madras (Fig. 21), the deviations are easily explained in terms of the movements of the main rain-bearing current of air. The south-west wind which brings heavy rain to Bombay, has little moisture left by the time it reaches Madras, but as the summer inflowing current of air "retreats" down the Bay of Bengal in autumn, before the seasonal reversal

occurs, it acquires a south-east direction and brings heavy autumn rain to the Carnatic coast. It is more difficult to explain why central and southern China and the Punjab in India have a varying and often considerable proportion of their rainfall in the winter months. The cause is apparently to be sought in the effect of the central mountain mass on the air currents; but, geographically, the fact is more important than the reason, for the cool season rainfall is often of much value to the farmer.

The two stations of Lahore and Hongkong (Fig. 22 and Table VII) have been selected to illustrate these two points of the generally low winter temperatures in China as compared with India, and of the frequency of deviations from the typical monsoon distribution of rainfall. Lahore, in the Punjab, is an inland station in latitude $31\frac{1}{2}^{\circ}$ at a height of 702 feet. The island of Hongkong (latitude 22°) lies just south of the tropic, the station being 108 feet above sea-level. The marked coolness of the winters for a place within the tropics should be noted, and also the small difference between the winter temperatures there and at Lahore, despite the higher latitude and greater elevation of the latter. The great summer heat at Lahore is associated with the small rainfall, with resultant dry air and clear skies, and with the mountain belt which protects it from all influences save those coming from the south. Hongkong has at once a much more exposed position and a far heavier rainfall.

In both stations, as compared with Bombay and Peking, a much smaller proportion of the total rainfall occurs in the period June to August, while, particularly at Lahore, a fair proportion falls in the period December to February. At Hongkong the flattening of the rainfall curve as compared with its peaked condition at Peking and Bombay is characteristic.

The climatic conditions in the two other zones may be more briefly dismissed. In the central region the general elevation above sea-level, and the remoteness from sea

influences, means that the winters are cold, often extremely cold in the more northerly latitudes, as in Mongolia, in the higher plateaux, and in the mountain-girdled basins. The summers are usually hot, particularly in Persia and the Tarim basin. But the essential feature is the aridity. Areas like central Arabia, the central desert of Persia, the enclosed Tarim basin and parts of the Gobi desert have scarcely any rain at all. In the south-west, however, the westerly air currents which bring winter rain to the Mediterranean Lands penetrate to some extent. Thus Baghdad in Irak and Tehran in Northern Persia have both about ten inches of rain in the year, falling mainly in the period from November to April, the other months being practically rainless. Again, the rain-bearing summer monsoon succeeds in penetrating parts of the eastern end of the zone, so that south-eastern Tibet round Lhasa has a considerable summer rainfall, and a strip on the southern edge of the Gobi desert also receives some rain then. But though such facts are of much theoretical interest, practically the important point is that, broadly speaking, cultivation throughout the zone is dependent on the possibility of irrigation from perennial streams fed by the snows of the high mountains.

In the northern belt the conditions recall those which we have already studied in Eastern Europe, with the notable difference that the winter cold is much more severe, and increases steadily to the north-east. Thus Tomsk, practically in the same latitude as Moscow (p. 14), shows a close correspondence in the amount (20 inches) and distribution of the rainfall, and has similar summer temperatures. But while the mean January temperature of Moscow is 12° F, that of Tomsk is -3° , that is fifteen degrees lower. As a result we find that while Moscow lies in the belt of mixed forest, Tomsk is in the taiga or coniferous forest belt. Barnaul, which like Tomsk is in Western Siberia, but lies a few degrees further south, has quite similar temperature conditions, but receives

only half the rainfall (10 inches). This means that it lies within the grassland area. It should be realised,

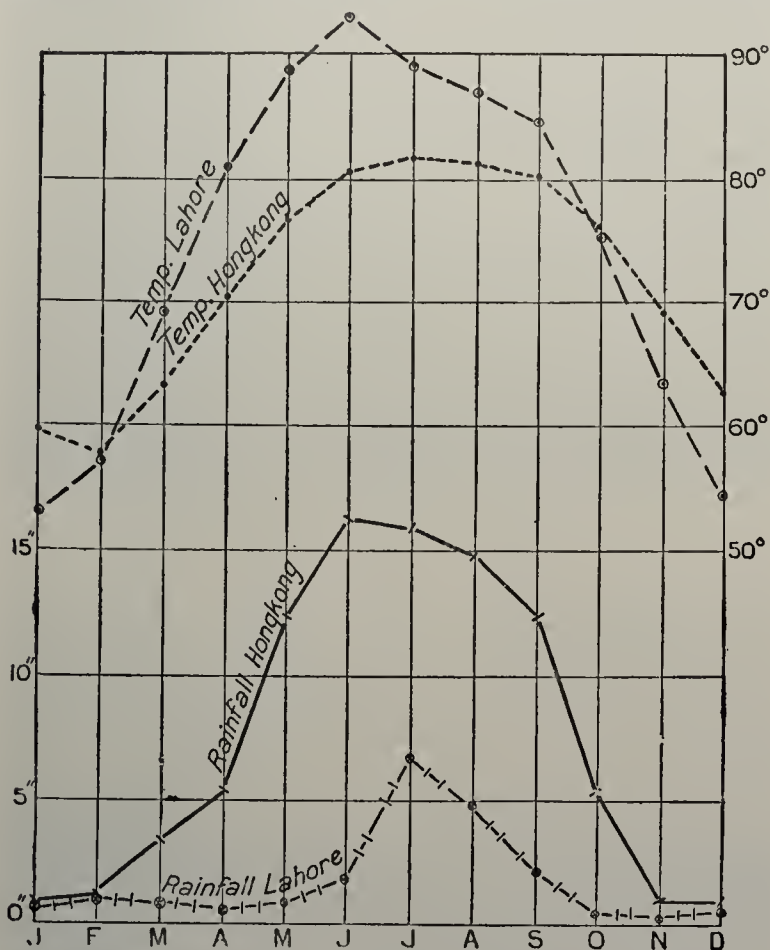


FIG. 22.—MEAN TEMPERATURE AND RAINFALL AT HONGKONG AND LAHORE.

however, that the lower summer temperatures, and the fact that the rain is mainly summer rain, means that the climate here is far less arid than that of Baghdad or of Tehran. In Eastern Siberia, Verkhoyansk, which lies,

however, within the Arctic Circle, has a mean January temperature of -60° , and is said to have the severest winters of any place on the earth. The highest January temperature ever recorded here was -13° . The station represents the culminating point of the north-easterly decrease in winter temperatures in Siberia, points further east having less severe winters.

POLITICAL UNITS. The major states of the monsoon region—the only part of Asia capable of supporting a dense sedentary population—are India, China and Japan. Till quite recent times Japan was purely an island state, with no direct interest in continental politics. India is cut off from the interior of the continent by the great mountain chains, the barrier being weakest in the north-west, where invasion is possible and has occurred in the past. No similar mountain crease separates the productive parts of China from the arid lands behind, and yet the Chinese type of culture has shown extraordinary stability, much greater than that of India, which seems so well protected by nature. This is probably associated with the cold or cool winters of China, which give its inhabitants greater stamina than is possible in the case of peoples exposed to the enervating climate of India. The Chinese have also evolved a very perfect system of agriculture which makes them rank among the best farmers in the world. As producers of food and agricultural raw material they need fear no competitors, and have virtually nothing to learn from others. British rule has increased the productivity of India, Russian penetration has led to Turan and parts of Siberia producing more food than they did before; but the permanent hold of the Chinese on their own lands is a result of the fact that no other people seem able to make these yield more agricultural produce than they do at present.

One would expect that this fact of the great productivity of the lands of China proper, combined with the aridity



SEA-COAST IN THE VICINITY OF THE TOWN OF SINGAPORE.
THE TREES ARE COCONUT PALMS



CHINESE VILLAGE NEAR SINGAPORE

The Chinese emigrate freely to the Malay region, where many of them are employed in the mines and plantations.

of the interior, would lead to constant risk of invasion. The Great Wall of China, is an indication that this danger was appreciated early. The Wall did not achieve its purpose, and a more effective response was the spread of Chinese rule over great parts of the interior, into Tibet, Eastern Turkistan, Mongolia, and Manchuria. Thus the former Chinese Empire extended over about one-fourth of the continent, the extreme western limit being the Pamirs.

North-west and north is a vast stretch of territory over which the rule of Imperial Russia was spread. Siberia, as we have seen, is similar in climate and vegetation to much of European Russia, Turan resembles the lands on the European side of the Caspian Sea. It was to be expected that an advance would take place here as Russia grew strong, and that advance led to nearly two-fifths of the continent becoming Russian. This area is still, if somewhat loosely, included in Soviet Russia. Thus the two political units of Russia and China cover between them more than half the continent of Asia.

The plateau of Iran is divided mainly between the two independent states of Persia and Afghanistan, parts of Baluchistan being included in the Indian Empire as elements in the defences of the weak part of the frontier. The break-up of the old Turkey has given rise to various new states on the western margin, the chief being Irak and the Sultanate of Nejd in Arabia. Of the monsoon lands outside of India, China proper and Japan, Siam remains an independent state, Indo-China is made up of a French colony and protectorates, while the Malay States are under British protection.

See Stamp, Asia (London, 1929), and Gregory, *The Structure of Asia* (London, 1929).

CHAPTER X

THE MONSOON LANDS : THE INDIAN EMPIRE—CEYLON

THE country which we call India has, owing to its northern mountain girdle and its peninsular shape, an appearance of unity which in point of fact it has never possessed. For its very diverse inhabitants it has not even a common name, for India is an invaders' term with a curious history. In the form *Sindhu*, meaning flood or ocean, it was first applied to the great Indus river. That form is kept in the name of the province of Sind, watered by the river, but the people were called Hind by the Greeks who gave the name Hind or India also to the land. By extension that name was used by Europeans for the whole country, but its modern Persian equivalent of Hindustan is still strictly speaking applied only to a part of the Ganges plains. No common language, no common religion, no identity of racial origin nor of tradition links together the peoples of India in our sense, and some geographers regard its use as justifiable only for the territories united by British rule.

Without going into this question, it should be noted that the name has a certain ambiguity. As a physiological unit, India may be defined as the area separated from the mass of the Asiatic continent by the end of the Iran plateau to the west, the Himalayas to the north and the Arakan mountains to the east. But the area under the British Crown extends in Baluchistan into the Iran plateau to the west ; in the protected state of Kashmir into the Himalayas to the north ; and in Burma over the

Arakan Mountains to the east. At the same time it does not include the whole of the intervening territory, for in addition to the small French and Portuguese territories the large native states are excluded. Including Baluchistan, Kashmir, Burma, and the native states the total area is 1,800,000 square miles, with a population of 319 millions. Excluding the native states the figures for area are over one million square miles, or about one-third of that of the United States of America, with a population of nearly 250 millions as against 120 millions in that country. The density of population in India is thus great, this being more marked in the British area than in the native states, which include large infertile tracts. This dense population is mainly engaged in agriculture, and the productivity of the agriculture is associated with the monsoon climate and the presence of vast plains with deep, fertile soil.

STRUCTURE AND RELIEF (Fig. 23). India, apart from Burma, may as we have seen be divided into the three major regions of the northern mountain girdle, the plains and the peninsular plateau; but this is only a very broad generalisation which requires to be elaborated. Burma may be described as consisting functionally of the great Irrawaddy valley with its bounding mountain chains. Its attachment to the Indian Empire, instead of to the Indo-China peninsula to which it belongs physiographically, is associated with the ease with which the coastal lowland of Arakan can be colonised from Bengal, and the need of protection for the cultivated central valleys from the turbulent mountain folk further east.

(1) *The Northern Mountains.* The main element in the mountain girdle of India is formed by the Himalayas, which diverge from the Pamir knot, trending first in a south-easterly and then in an easterly direction. They consist not of a single chain but of a series of ranges, separated by deep valleys, and are continued both at their western and eastern extremities by minor chains

which complete the mountain barrier. The limits of the Himalayas may be said to be defined by the two gigantic rivers of the Indus and the Brahmaputra or Sanpo. These rise near together in the lake region of the Tibetan plateau, and after flowing in exactly contrary directions, break through the mountains in enormous gorges, the Indus passing through Kashmir on its way to the Punjab, and the Brahmaputra traversing the plains of Assam to form a joint delta with the Ganges in Bengal. The Sutlej, one of the great tributaries of the Indus, also rises north of the Himalayas, not far from the Indus and Brahmaputra, and similarly breaks through the mountains to enter the Punjab. The Ganges rises on the south side of the mountains, but the Gogra, one of its tributaries, originates in the same region as the three rivers already named.

Of the states on this northern borderland, Kashmir is mainly mountainous, but includes in its famous valley a fertile, alluvial tract, formerly a lake bed, on the course of the river Jhelum, another tributary of the Indus. Here stands the capital, the town of Srinagar. British interest in Kashmir is due largely to the fact that it includes the famous Karakoram Pass (over 18,000 feet), which allows of a difficult passage to Yarkand and thus to Central Asia generally. Further east the native states of Nepal and Bhutan are little-known mountain lands, Mount Everest (29,000 feet), the highest mountain of the globe, lying on the northern border of Nepal. Between the two is Sikkim, a British protectorate lying just north of the hill station of Darjeeling. Through it there passes an important route to western Tibet and to Lhasa, the Tibetan capital.

The main fact of interest about the subsidiary mountain chains which complete the boundary of India to the west and east is that being much lower, and with comparatively easy gaps, they afford possible lines of entrance to an invader. Particularly important from this standpoint

is the western area, whence the historic invasions have always come, for the great plains have an irresistible attraction for the inhabitants of the higher, drier and less fertile lands to the north-west. It is sufficient to notice

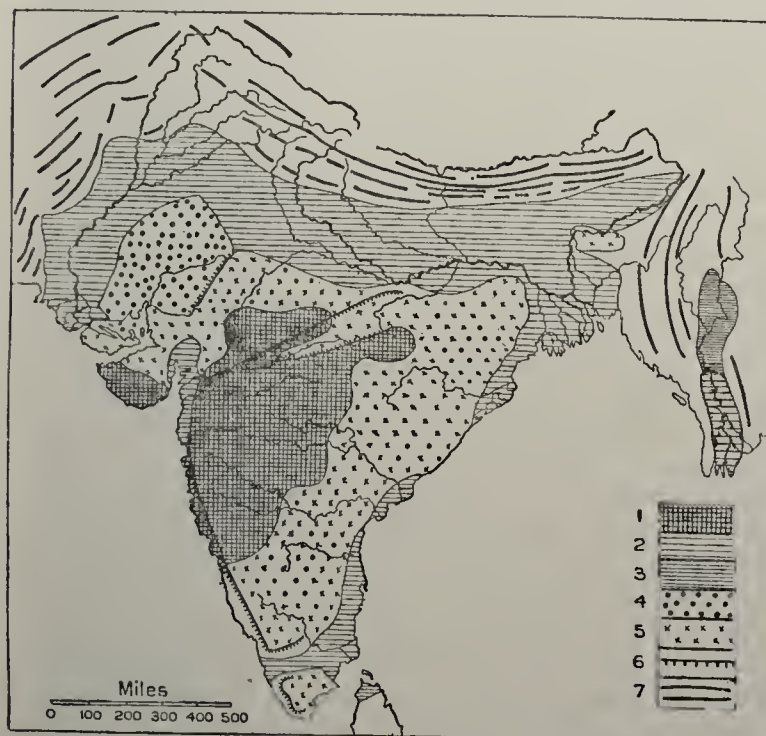


FIG. 23.—THE STRUCTURE OF INDIA.

1. The basaltic rocks of the Deccan; 2. The alluvial plains; 3. Low tertiary plateau of central Burma, consisting of almost unfolded rocks, yielding mineral oil; 4. The Thar desert; 5. The Indian crust-block; 6. Fault-lines and plateau-scarps; 7. Young fold-mountains, forming the Himalaya and their continuations.

that, apart from the arid coastal route, there are two main lines of entrance, one centring round the Khyber pass and the other round the Bolan. The Kabul river, with the town of that name on its upper course in Afghanistan, breaks through the mountains in a steep gorge, and after passing through the basin of Peshawar joins the Indus.

The actual gorge is impassable, but the Khyber pass lies slightly to the south, and does not quite reach a height of 4,000 feet. The Bolan pass, now crossed by a railway, connects Jacobabad, in the plains of the lower Indus, with Quetta in Baluchistan, from which Kandahar in Afghanistan can be reached. This pass rises to nearly 6,000 feet, and though there is a Bolan river it does not reach the Indus as the Kabul river does, being lost in the sands of this desert part of Sind. The contrast in height between these two passes and the Karakoram should be noted in connection with the risk of invasion here.

(2) *The Plains.* The vast depression which lies between the mountains and the plateau has been filled up by the waste brought down by the three great river systems of the Indus, the Ganges and the Brahmaputra. Of the three divisions the Gangetic plains are much the most extensive and also the most densely peopled. Because of the trend of the Himalayas the Indus plains extend much further north than those of the Ganges, so that the Punjab plain extends north of latitude 32° , while the Ganges delta reaches to the south of latitude 22° . The two extremes are thus separated by a difference in latitude comparable to that between London and Rome, with a resultant marked difference in climate and products. Everywhere the potential fertility of the plains is great, because of their level, easily ploughed surface, and the depth of the alluvial soil, which is constantly being renewed by the loads of silt brought down by the rivers in the flood season. The actual productivity of the different parts depends mainly upon the water available, whether derived directly from the rainfall or obtained by means of irrigation.

The Indus flows through the Punjab, receiving the waters of its five great rivers, the Jhelum, Chenab, Ravi, and Sutlej, with the latter's great right-bank tributary, the Beas. The region has a comparatively small rainfall, but the rivers supply much irrigation water. Thereafter the

united stream flows through the arid area of Sind, where it is comparable to the Nile in Egypt. But the river, which does not flow through a well-defined valley and is difficult to control, is of much less value for irrigation purposes than the Nile, so that the historical significance of the area has been much less. Important irrigation schemes are now in progress.

The plain of the Punjab is separated from that of the Ganges by a low water-parting. A characteristic feature here is the number of streams which now sink down into the loose soil but seem once to have found their way to the Indus. In addition to its great Himalayan tributaries, such as the Jumna and the Gogra, the Ganges also receives water from the plateau, as in the Chambal and the Son. The greater volume of the mountain tributaries causes the main stream to lie well to the south of the plain, just as—to compare great things with small—the Po is pushed to the south of the plain of Lombardy by the greater volume of its Alpine feeders. A north-easterly prolongation of the plateau, the extremity of which forms the Rajmahal Hills, forces the Ganges, nearly in the latitude of Calcutta, to turn sharply south to enter the delta region of Bengal. A special feature of the Ganges plains is that a certain amount of elevation has taken place, so that the rivers are to some extent excavating their beds. This makes a distinction between the upper, well-drained areas and the valleys. Cultivation must always have been easy here, the one difficulty being water supply. Below the region round Patna, where Son, Gogra and Gandak converge on the Ganges, the rainfall is high enough to make irrigation unnecessary. In the upper parts of the plain at the foot of the Himalayas, between the Ganges and the Gogra, water can be obtained anywhere by the sinking of wells, of no great depth, and irrigation canals are scarcely necessary. Between the Jumna and the Ganges, however, in the United Provinces, they are very numerous.

The plains of Assam are divided into two parts by the Assam highland (the Khasi Hills), the larger part lying in the valley of the Brahmaputra and the smaller in that of the Barak, or Surma. Here the rainfall is very heavy, the rivers flow on the same level as much of the surrounding land, so that there is much swamp, and the jungle is also dense. The less favourable conditions, and the distance from the north-western gate through which the races who brought civilisation to India entered, have made Assam backward. Here, therefore, land is available for plantations under European control, while the Ganges plains are fully cultivated by native folk.

(3) *The Tableland.* The third structural element in India is the old crust-block to the south, built up mainly of crystalline rocks and ancient sediments, the latter including coal-bearing beds. To the north-west, however, in the region lying behind Bombay and extending into the peninsula of Kathiawar, is a vast stretch of basaltic rocks, the Deccan trap, of much younger date. The basalt is particularly important because it weathers to form a fertile, dark-coloured soil, peculiarly retentive of moisture, and well suited for cotton cultivation. This Black Cotton soil contrasts markedly with the red laterites which occur elsewhere on the plateau, since these dry out readily and require irrigation before they yield crops.

In the basalt-covered region two important streams occur and enter the Gulf of Cambay. The one is the Narbada and the other the Tapti, both having cut deep valleys on the surface of the plateau. To the north of the Narbada valley is a considerable range of mountains, the Vindhya Hills, while the two valleys are separated by the Satpura Range. These hills are regarded as marking the northern boundary of the Deccan plateau, which as thus defined does not coincide with the crust-block (see Fig. 23). The latter extends to the north-west in the Aravalli Hills which overlook the Thar Desert, and forms also the

undulating country of Central India, which stretches from west to east, and slopes gently down to the plains. Much of this region, so far as human development is concerned, has tended to be attached to the plains, from which, however, it is structurally quite distinct.

South of the Tapti valley the edge of the plateau is broken off sharply towards the Arabian Sea, from which it is separated by a very narrow plain. The steep edge forms the continuous line of the Western Ghats, rising to nearly 9,000 feet in the Nilgiri Hills to the south. Here is a very important break, the Palghat Gap, which allows easy communication from Calicut with the east across the narrowed southern end of the peninsula. Elsewhere the passes through the Western Ghats are steep and difficult. Two of great importance are the Thal Ghat (over 1,900 feet), which allows a railway from Bombay to reach the surface of the plateau, and so the northern plains by way of the Narbada valley, and Calcutta by a more direct route; and the Bhore Ghat, also behind Bombay, but further south and higher (about 2,000 feet), which is traversed by a railway connecting to Madras and having branches to various parts of the Deccan, including the coalfields of the Central Provinces and Hyderabad. Beyond the Palghat Gap the ground rises again in the Anamalai and Cardamom Hills.

From the eastern side of the Western Ghats the surface of the plateau slopes gently downwards towards the Bay of Bengal, into which the great rivers of the tableland flow. The chief of these are the Mahanadi to the north, the Godavari, which has a joint delta with the Kistna, and the Cauvery. The rivers have cut wide valleys in the plateau, and although the name of Eastern Ghats is given to its eastern edge this lacks both the continuity and the height of the Western Ghats. Further, since the rivers have long courses on the plateau surface, they bring down much waste, forming extensive deltas, so that the coastal lowland is wider than on the west. This is particularly

true to the south, where Madras stands near the centre of a long and wide stretch of coastal plain. The ease of irrigation here, as compared with the plateau heights above, gives rise to a very dense population, the densities recalling those of the northern plains.

CLIMATE AND CROPS. The primary purpose of Indian agriculture is to yield food, material for clothing (fibres) and illumination (vegetable oils) for the use of the peasant cultivators. Since, except for the general use of milk and clarified butter (ghee), the peasants are mainly vegetarian, plants yielding food directly are of great importance, and about 80 per cent. of the arable lands are under grain crops, though not all of these are consumed at home. The effect of the climatic conditions on the nature and productivity of Indian agriculture is therefore very important.

It is usual to divide the Indian year into three seasons, the cold season from October to March, the hot season from March to June, and the rainy season from June to October. But this division is apt to give an impression of greater uniformity throughout the whole country than actually exists, and a slightly more detailed division is as follows :—

A. Period of N.E. Monsoon.

1. The cold weather season (January to February).
2. The hot weather season (March to mid-June).

B. Period of S.W. Monsoon.

3. The season of general rains (mid-June to mid-September).
4. The season of the retreating monsoon (mid-September to December).

Taking these in order we find that in (1) the adjective cold is a relative term. Broadly it may be said that January temperatures in India are comparable to July temperatures in parts of Europe, as follows :—

AV. MONTHLY TEMPS.	INDIAN TOWNS JANUARY	EUROPEAN TOWNS JULY
—	—	—
56°	Multan	Christiansund
58°	Delhi	Edinburgh
65°	Calcutta	Paris
75°	Madras	Genoa
78°	Calicut	Corfu

In other words, except at high stations in the northern hills, in no part of India do cold season temperatures fall below those at which temperate crops ripen in Europe; there is no winter check to growth. Further, not only are January and February temperatures like those of European summers, but there is also abundant sunshine then. Rain is, however, generally deficient, but occurs in moderate amounts in the north-west, in the Punjab and to a smaller extent in the western part of the United Provinces. Generally we may say that while in the north-west cold season conditions recall those found in summer in northern and central Europe, though with less rain, throughout the rest of India the conditions then recall those of the summers in Mediterranean stations, with their well-marked summer drought.

In (2), the hot season, temperatures rise with great rapidity, especially in the western part of the plains, where they reach heights unknown in Europe. In Sind, the Punjab and the United Provinces, where drought is intense, the heat is much more marked than in the south or even in the Lower Ganges plains. Burma, Assam and parts of Bengal receive a considerable amount of rain with thunderstorms during this season, and some rain also falls in the south-western part of the peninsula; elsewhere the season is one of intense drought.

About (3) the middle of June a very marked change occurs with the "bursting" of the monsoon, that is the onset of heavy rain. The south-westerly wind blows with

great violence over the Arabian Sea, and striking the west coast from the extreme south to the Gulf of Cambay, brings torrential rain to the seaward side of the Western Ghats. It continues across the plateau as a somewhat drier wind. Another branch of the monsoon current blows up the Bay of Bengal and is sucked into the funnel of the Ganges valley, being reinforced by the winds which have blown across the tableland. Thus the whole of the western coast south of the Gulf of Cambay, much of Burma, Assam, and the lower part of the Ganges valley receive very heavy rain. Areas of less rain include a considerable part of the tableland and the more southerly parts of the east coast, also the upper parts of the Ganges valley and the Punjab. Sind receives hardly any rain at all, and only the eastern part of Rajputana any considerable amount. Temperatures during the rains are, as a rule, lower than in May, but the dry regions, such as Sind, remain very hot.

By (4) mid-September the rains slacken and temperatures often rise again with the drier air. As the monsoon retreats parts of the eastern coast receive belated rains. Thus Madras gets only 15 inches during the four months from June to September inclusive, but has 18 inches in the two months of November (the wettest month) and December. Elsewhere these two months are generally dry.

Bearing in mind that most crops require a warm, dry season for ripening, it is obvious that there are two possible harvest periods in India, the hot and mainly dry season, from March to mid-June, corresponding in time to our spring, and the warm season, which occurs in September and October, when the rains slacken, corresponding to our autumn. But for growth all crops require moisture in addition to an amount of heat which varies with the kind of crop. From what has been said about precipitation it is clear that in most parts of the country the crops harvested in autumn are likely to be the more important

because they receive the benefit of the copious monsoon rains. Among such crops rice, cotton, jute and sugar-cane may be mentioned.

In the lower part of the Ganges valley, Assam and the western coastal strip, such crops are sufficiently watered by the rains. Even where the actual rains may be, as in Sind, totally insufficient for any kind of crop production, or at best scarcely sufficient and in many seasons inadequate, as in the Punjab and parts of the Upper and Middle Ganges valley, the fact that the rains are heavy in the hills swells the great rivers and makes irrigation by canals possible. Similarly on the east coast of the tableland the delta sections of the rivers can be readily irrigated by canals. On the surface of the tableland, where the rains are moderate and variable, the retentive black cotton soil may make irrigation unnecessary. Outside the limits of this soil type canal irrigation is difficult because of the way the rivers are sunk below the general level and their comparatively small volume, and tanks or reservoirs are constructed to hold up the short but heavy falls of rain, and thus prevent the water running to waste. Wells are also extensively used, just as they are in the plains. Where, as happens in various parts of the interior of the tableland, the rains are not heavy and irrigation is difficult, the tendency is to concentrate on crops requiring relatively little water. The millets, so extensively grown in the Deccan, are examples.

The spring-harvested crops are particularly interesting. In the north-west, where the winters are really cool, and light winter rains occur, wheat can be sown in autumn, and harvested in spring. Even in the Punjab, however, with its large wheat production, the rains are not generally sufficient for the growth of the crop. It is usually irrigated at times, and another common practice is to water the fallowed lands heavily in autumn when flood water is available, and sow the seed on the moistened ground. This suggests that where the soil is retentive, as in the

Black Soil region, or where irrigation is possible, there is no reason why the period of the north-eastern monsoon should be wasted. Among the more important cool season crops, in addition to wheat, are barley, chick peas or gram, a very important food in India as it is in Spain, and some oil-seeds, especially linseed, the seed of the flax plant, not grown in India for fibre, and rape, a plant of the cabbage family. The Punjab is particularly interesting because there the cool season crops, including much wheat, occupy a slightly larger acreage than the summer crops, of which cotton is the most important.

This general account of Indian agriculture leads up to the question of Indian famines. Famines in India are never universal, for they do not occur in regions like lower Bengal and Assam, where the rains are always more than sufficient, nor in places like Sind, where there are always deficient but where the population is small. Famines in India were and to some extent still are a recurring phenomenon in regions where the population is dense and the mean rainfall is just sufficient. If for one or more successive years the rainfall drops below the mean, widespread failure of crops results. The chief famine areas are (1) north-western and central India, especially the southern Punjab, eastern Rajputana and the United Provinces; (2) parts of the centre of the tableland, including the large native state of Hyderabad; (3) central Burma. In the past one of the great difficulties has been the bad communications which made relief measures almost impossible; this has now been largely remedied. An important preventive is the improvement of means of irrigation to obviate too great dependence on the rains of any one season. Owing to these two causes, better communications and more extensive irrigation, monsoon failure does not now produce such terrible loss of life as it did formerly.

THE CHIEF CROPS. Fig. 24 shows the distribution of the main cereals of India. The distribution of rice should

be particularly noted. The rice of India proper does not enter the world market to any extent, rice being exported mainly from Burma, which has a much smaller population and thus absorbs less of the home-grown crop. Oil-seeds, which in addition to rape and linseed include also sesame,

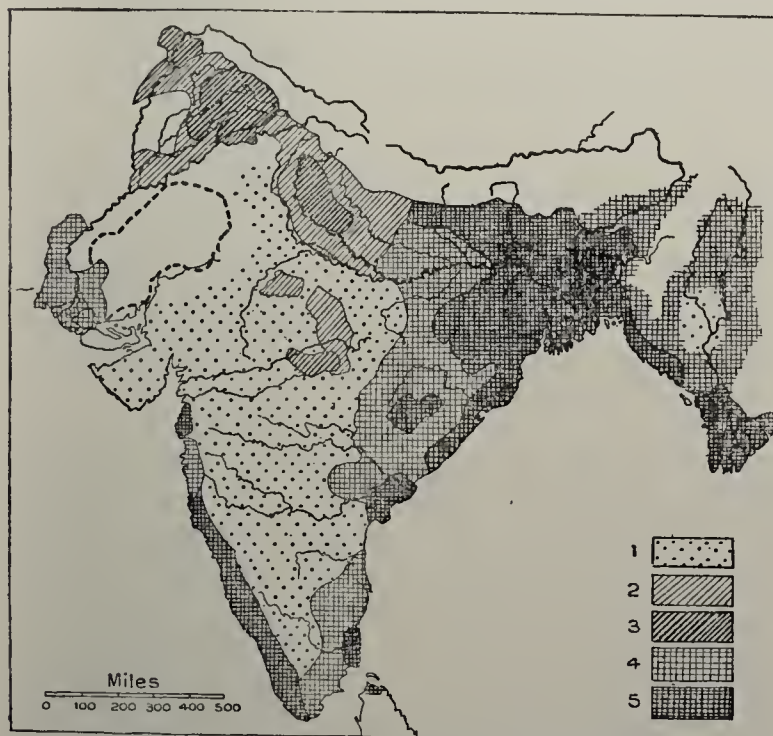


FIG. 24.—DISTRIBUTION OF CHIEF CEREAL CROPS OF INDIA.

1. Millets; 2 and 3 wheat, 3 being areas of maximum production; 4 and 5 rice, 5 being areas of maximum production.

mustard, castor oil, and ground nuts, are widely distributed, but are cultivated especially in the region behind Bombay. Vegetable oils are of great importance in India, being used in some cases (e.g. sesame) for cooking, also for lighting, while they are exported for use in soap-making and lubrication. Jute is practically confined to northern and eastern Bengal. Formerly exported mainly

to Dundee, it is now largely manufactured in Calcutta. Cotton is grown especially behind Bombay, which has extensive cotton mills, but also in the Punjab and Sind, in the United Provinces and in the southern part of the tableland. Silk is widely but not very extensively produced in India, the mulberry being cultivated for silk-worm rearing, and "wild silk" also collected. Tea is not a native crop, but is grown in plantations in Assam and in the Darjeeling region. In the last-named, as well as in the south-west, quinine, introduced from South America, is produced in plantations under the auspices of the government, but the product is absorbed in India, where malaria is rife. Coffee, some rubber and spices are also produced in the south-western region, and tobacco is grown there as well as in the plains; the opium poppy is grown, especially in the Ganges valley and in Central India.

India has a fairly extensive cattle-rearing industry, especially in the drier parts. The chief cattle reared are the humped forms, with buffaloes in the moist region of the lower Ganges. Indian cattle are employed mainly for draught purposes, not for meat, and are not of high standard, but give rise to a considerable export of hides.

MINERALS, TRADE AND TOWNS. India is fairly rich in coal, though the quality is not very high. The most important coalfield extends from western Bengal into Central India and is worked especially at Jherria and Raniganj, to the north-west of Calcutta. The fields are near rich deposits of iron ore, and the new town of Jamshedpur, near Sini, some 170 miles due west of Calcutta, is becoming a great industrial centre. In connection with the growth of metallurgical industries in this part of India it is interesting to note that the mineral oil of Burma and of Persia creates a considerable demand for "tins," and that tin ore is available in the Malay region. A local tin-plate industry is arising in consequence, which is competing with that of South Wales (p. 47). Coal occurs

also on the Deccan plateau (p. 176), and gold on the slopes of the Nilgiri Hills and in eastern Mysore.

The chief exports of India are raw and manufactured jute, the manufactured material, chiefly in the form of gunny bags, now greatly exceeding the raw fibre by value ; raw cotton, the amount of manufactured cotton being relatively small ; rice, mainly from Burma ; oil-seeds ; tea ; hides and skins ; wheat and wheat flour, with many others. It is notable that India exports large amounts of food material and fibres, yet there is no doubt that vast numbers of the peasants are insufficiently fed and inadequately clothed. A rise in the standard of living would probably diminish the exports of these commodities. The imports consist mainly of cotton manufactures, metals and ores, with machinery and other manufactured goods ; but it is remarkable that among imported food materials sugar ranks high. The home crop is in this case quite insufficient to supply the needs of the population.

Almost all the sea-borne commerce of India, as distinct from Burma, passes through the four ports of Calcutta, Bombay, Madras and Karachi, the first two being by far the most important. Bombay (1,176,000), on an island, with an excellent, well-sheltered harbour, now slightly exceeds Calcutta in size, and is the exit (note its railway connections, p. 177) of an important area, producing especially cotton and oil-seeds. Its cotton manufactures are very important, the advantages of local raw material, cheap labour and a large local market counterbalancing the fact that coal has to be brought by rail from a considerable distance and is thus dear. The agricultural products of the Ganges valley, and the manufactured goods of the industrial area, especially jute fabrics, leave India through Calcutta. Karachi is mainly important because of the wheat of the Punjab and the cotton of the Punjab and of Sind. It has been increasing rapidly in importance, and includes nearly a quarter of a million

people, while Madras, the centre of a productive area, has half a million. Rangoon is the main port of Burma, which exports, in addition to rice, much teak, also petroleum, with some rubber and precious stones. Of the inland towns the most important, such as Delhi, Benares, Lahore, etc., lie in the northern plains. Delhi, the capital of India, on the right bank of the navigable Jumma, at a height of over 700 feet, is a very important route town, being in the direct route of an invader advancing from the north-west passes to the Ganges plains. In winter it is cool (p. 179), while to the north lies the hot-weather station of Simla. Mandalay is the most important inland town of Burma.

CEYLON

CLIMATE AND PRODUCTS. The island of Ceylon is a Crown Colony, with a total area of about 25,000 square miles, or half that of England, and a population of five millions, equivalent to that of Scotland. It is mountainous in the south and has plains in the north. Since it lies in latitudes 6° – 10° the temperatures on the lower grounds are uniformly high, there being an annual range of only 3° at Colombo. The south-west is well-watered by both monsoons, but the northern plains are dry and scantily peopled. So far as temperatures are concerned Ceylon is capable of producing a great variety of crops, but the land is not everywhere fertile and only about 18 per cent. of the total is arable. The lower grounds in the south-west are tilled by peasant cultivators, producing crops similar to those of India, rice being very largely grown. The yield is, however, comparatively small, and Ceylon does not produce enough rice to feed the labourers on the European plantations, so that this cereal has to be largely imported. A very large extent of land is under coconuts, grown generally by the natives, though some of the plantations are under European control. Products of the coconut palm, in the form of copra, or

dried coconut, desiccated coconut, coconut oil and coir, the fibre obtained from the outer husks of the nuts, bulk very largely among the exports. On the slopes above are numerous plantations controlled by Europeans and worked mainly by labourers coming from southern India. The most important of these are the tea and rubber plantations, but cocoa is also grown, also cinnamon, with minor crops. Tea and rubber are the chief exports by value, but Ceylon is also important as a source of pure graphite, or plumbago, used for pencil-making. Various kinds of precious stones occur. Colombo is a very important port and coaling station, being on the Suez Canal route to Australia and to the Further East as well as to Calcutta.

An excellent detailed account of the climate of India is given in Kendrew's *Climate of the Continents*. An article by A. V. Williamson in the *Geographical Journal* for February, 1925, gives a clear and interesting account of irrigation in the Indo-Gangetic Plain. See also the *Oxford Survey of the British Empire*; Simkins, *The Agricultural Geography of the Deccan Plateau* (London, 1928); *Report of the Royal Commission on Agriculture in India* (London, 1928).

CHAPTER XI

THE MONSOON LANDS : CHINA—JAPAN—INDO-CHINA AND THE MALAY ARCHIPELAGO

CHINA

The great republic of China consists of the 18 provinces of China proper, with which the three provinces making up Manchuria should now be included, and the outer territories of Mongolia, Tibet and Sinkiang, or the New Dominion, which includes what used to be called Eastern or Chinese Turkistan. The 18 provinces of China cover an area of one and a half million square miles, or more than one-half of that of the continental United States of America, with a population variously estimated but probably about 380 millions. They are characterised by their dense agricultural population, cultivation being of the intensive, gardening type, absorbing much labour but being correspondingly productive. Throughout the climate is monsoonal, but, as already seen, the winters are much colder than in India, and in North China, where the characteristic Chinese culture arose, they are cold.

The monsoonal rains extend into Manchuria (364,000 square miles), which is being rapidly colonised from North China, and can produce the same kind of crops. The present population is possibly in the neighbourhood of 20 millions, but there is still room for many more people. The populations of Tibet, Mongolia and Sinkiang are small, and though the addition of these gives the enormous

total of four and a quarter million square miles for Chinese territory, the figure is of little significance owing to the vast extent of mountains and barren lands. Sinkiang is completely shut off from the monsoon rains, and Tibet and Mongolia receive these only on their extreme eastern margins, so that all are arid. Intensive cultivation is only possible in small areas where irrigation water is available, and stock-rearing acquires an importance which it cannot have in densely-crowded China.

POSITION AND RELATIONS OF CHINA. Peking is in latitude 40° N., this parallel being that which virtually bisects the western basin of the Mediterranean Sea, and marks roughly the position of towns like Valencia, Naples and Salonika. The parallel of 30° N., on which stands Cairo in Egypt, is crossed several times by the Yangtze, the central river of China, and Shanghai, the great sea-port of Middle China, is in about this latitude. Canton, in South China, stands practically on the Tropic of Cancer, corresponding in latitude to the Indian towns of Karachi and Calcutta. These easily remembered facts give one a general idea of the range of latitude in China proper.

China has always been relatively isolated from the rest of the world, and this is due particularly to the nature of its western frontier zone. This is made by the plateau of Mongolia to the north and the great chains bounding Tibet further south; but the isolating effect of lofty mountains and arid plateaux is greatly accentuated by the enormous stretch of territory which they cover. Overland routes into China, therefore, are comparatively few and difficult. But to the north-west the separation between the productive lands of China and the wastes beyond is much less definitely marked by nature. More than 200 years B.C. the First Sovereign Emperor of China recognised this fact and built the Great Wall to keep out the horseman of Mongolia. But the line then selected did not mark the limit to which the patient cultivators of North China could advance, and there has been a pro-

gressive movement, which is still going on, of cultivators into what seemed once to be wastes.

But until Chinese civilisation was consolidated within the first essential was to keep invaders out, and two possible lines of entrance are of great interest. From Siberia across the Gobi desert there leads an important caravan route which finally emerges from the plateau through a gap marked by the town of Kalgan, lying to the north-west of Peking. The Great Wall crossed the Kalgan gap, and the position of the capital Peking in relation to this dangerous gap is noteworthy. But not only does the frontier of China extend beyond the line of the Wall in the Kalgan area, but a railway now runs from Peking to Kalgan and beyond, a striking illustration of the changes which have taken place since the Wall was built.

The second great line of entrance has been of much historical importance. After leaving Tibet, where it rises, the Hwang Ho, the great river of Northern China, swings north in a huge bend, then flows east, turns sharply south to flow in a gorge section, from which it emerges to flow east once more. Where it emerges from its gorge it receives a west-to-east flowing tributary, the Wei Ho. The valley of this river is believed to have been the first seat of Chinese culture, but the point of immediate importance is that from the valley it is possible to reach by an easy pass the Hwang Ho at Lanchow, placed where the river begins to turn northwards. From Lanchow there leads out into the wastes a route lying between the Great Wall and the lofty Nan Shan Mountains, between that is to say the edge of the Tibetan plateau and the Mongolian desert. From this gateway a highway of invasion and of trade leads along a line of oases across the desert. By skirting the southern slopes of the Tien Shan Mountains the route can be continued into the Tarim basin and to Kashgar, whence Western Turkistan can be reached by high passes. A route along the northern slopes of the Tien Shan, again,

leads by the Dzungarian Gate to southern Siberia. It is believed that the first origin of Chinese culture is to be sought in the Tarim Basin, and that it reached the Wei Ho valley by the route just described. It has always been a much-frequented trade-route. The point where the route enters China proper is called the Jade Gate, because jade from Chinese Turkistan was brought in by this route.

One other overland line of entrance into China may be named. The Yangtze rises in eastern Tibet, where its headstream flows in a stupendous gorge parallel to those occupied by the Salween and the Mekong. From India proper and from Burma it is possible to force a way into the Yangtze valley, as well as into that of the Sikiang, the largest river of South China. These are also old trade routes by which elements of Chinese culture have entered the country. The isolation of China is thus not complete; its peculiar culture did not originate wholly within the country, but has features in common with that of Babylonia and of the Indo-Iranian area. It owes its special features to the conditions which prevail within the country, and to these we must now turn.

THE MAIN DIVISIONS (Fig. 25). Though its basis is not wholly clear on the atlas map, the primary division of China is into North and South. The dividing line is the Tsingling range, which lies between the Wei Ho and its continuation in the Hwang Ho valley, and the upper valley of the Han tributary of the Yangtze. This range is really a lower continuation of the Kunlun Mountains of Tibet. Eastward the Tsingling sink down to the wide northern Chinese plain, so that the distinction seems to break down. Historically the division line here has not been, as one might suppose, the hills which form the Yangtze waterparting to the east of the lower Han valley, but the marshes and infertile lands around the Hwai river. This river is apt to be obscured on maps by the broad line showing the former course of the Hwang

Ho, but the ill-drained region through which it flows was for long a great obstacle to the southward advance of the North China culture. On a detailed population map a slight thinning of the population here shows that the Great Plain of China has never been so completely a unit from the human standpoint as it is from the physiological one. The extension of the Yangtze provinces of Kiangsu and Anhwei into the plain should be noted in this connection.

As thus bounded North China consists of an upland interior and a wide coastal plain, interrupted only by the hilly peninsula of Shantung. This seems to be broken off from the similar peninsula of Liaotung to the north, the two defining the Gulf of Pechili. The main river of the plain is the lower Hwang Ho, but the Pei Ho, near which stands Peking, should also be noted.

The whole region shows a curious combination of advantages and correlated drawbacks which goes far to explain the history of China. In the uplands the prevailing soil is loess, apparently an accumulation of wind-borne dust from Mongolia and reaching enormous thicknesses. The loess is very fertile when sufficient water can be supplied, must always have been practically treeless, and thus required no clearing for early cultivation, and permits of the use of wheeled vehicles without elaborate road construction, this forming a great contrast to South China. On the other hand it dries out easily, and is so readily eroded that the rivers carry an enormous amount of silt (Hwang Ho = Yellow river). That silt again both limits the value of the streams as waterways, and makes it necessary for the cultivators to engage in a constant struggle to prevent their field being overwhelmed by the floods which result from the way the rivers block their own beds with alluvial material. The plain is for the most part floored by such water-borne material, generally also very fertile, but with sterile areas.

In addition to building up the plain the rivers carry

their load of waste seawards and the coasts, except for the hilly Shantung peninsula, are low and generally harbourless. Thus the Chinese of the north are not seafarers, and the British station of Weihaiwei and the formerly German one at Kiaochow Bay on the Shantung peninsula, no less than the Kwantung area on the Liaotung peninsula,

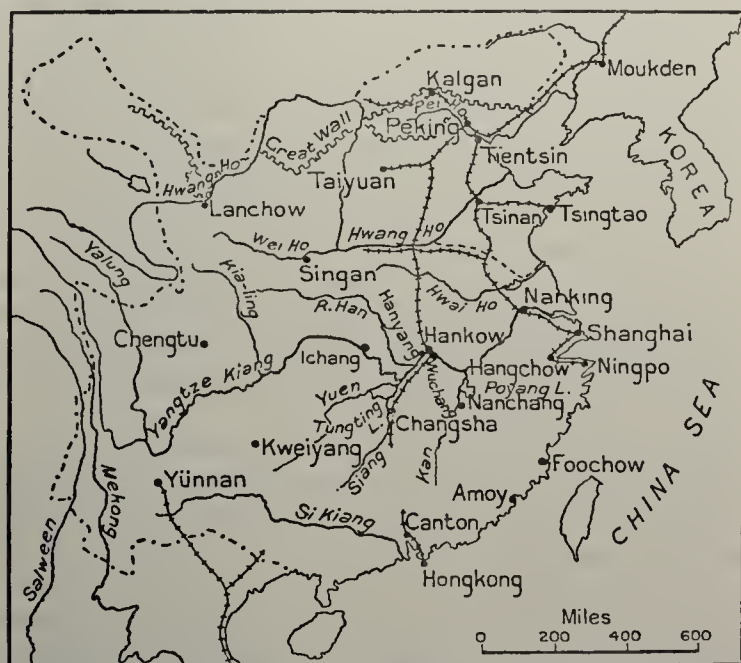


FIG. 25.—SKETCH-MAP OF CHINA.

first Russian and then leased to the Japanese, illustrate the tendency for foreign powers to occupy those exceptional areas suitable for the establishment of harbours.

Though rice can be grown as far north as the mouth of the Pei Ho, North China is characterised by the predominance of harder cereals, such as wheat, barley, maize and millets, together with many kinds of vegetables. Silk is produced, especially in Shantung, and cotton is

fairly widespread. Large stock animals, nowhere very abundant in China, are here more numerous than in the south, and include horses, donkeys, camels and cattle; in the south man is often the only pack animal. Pigs and poultry are extensively reared. In addition to its agricultural produce North China is remarkable for the enormous deposits of coal in Shansi, the coal being accompanied by iron. As yet the deposits are little worked. Peking, with Tientsin as its port and Taku as an outport, is the most important town, but Singan, in the Wei Ho valley, an ancient capital, is of particular interest.

The Chinese of the north are very hardworking and, as one would expect from the cold winter climate, are of strong physique. Despite the energy and skill of the cultivators the holdings do not yield enough to maintain a reasonable standard of life, and there is much emigration, especially in years of crop failure. Emigration takes place mainly to the north, to Manchuria and also to some extent to Mongolia.

Topographically South China is much more complex than the north, and falls into two main sections, Middle China or the Yangtze basin, and the hill country of the south proper. From the human standpoint, however, there are throughout certain outstanding contrasts with the north. Thus rice, grown by an elaborate system of irrigation, and as in India with the aid of the water buffalo, is the main cereal crop. It is generally consumed locally, but such provinces as Anhwei, Kiangsu and Honan yield a surplus available for use in the north. In addition to the cotton and silk shared with the north, tea and sugar cane are important crops, with many subsidiary ones, including a number of fruit trees. Owing to the absence of the deep mantle of loess which cloaks the uplands of the north, cultivation is mainly limited to the valleys and basins, and does not ascend to the same height above sea-level as in the north. Except for the great waterways inland communication is difficult, but a very notable fact

is that south of Hangchow Bay the mountains approach the sea, giving rise to a ria coast (p. 61), rich in harbours. The sea thus plays a larger part in the life of the people than it does to the north, coastal trading—no less than piracy—being very important, and the surplus population tends to migrate by sea rather than by land, infiltrating the islands and peninsulas of the far south (Plate VII), and being always available there as a source of labour in mines, plantations and so forth.

The Yangtze basin can be divided into three sections, the Red Basin of Szechwan, the Central or Hupeh Basin and the Delta Region. The Red Basin is floored by fertile alluvial soil, is rich in minerals, and has a wonderful system of irrigation. It is densely peopled and produces rice, tea, opium, and silk, with some cotton. The great drawback is the isolation, due especially to the long series of rapids on the Yangtze above Ichang, which cut it off from the Central Basin. This, next to the northern plain, is the largest lowland area in China, owing its size not only to the zigzags of the main river but to the great tributaries. These consist of the Han on the left bank and the Siang, the main feeder of the Tungting lake, and the Kan, similarly feeding the Poyang lake, on the right bank. All, but particularly the two latter, form important route lines, and the convergence of waterways accounts for the great group of three cities, Hankow, Wuehang and Hanyang. Hankow is connected by rail to Peking, and when the southern section, from Wuehang to Canton, by way of the Siang valley, is completed, China will be traversed from north to south by rail. This Central Basin produces particularly cotton, rice and tea, and is rich in minerals, Hanyang having important iron and steel works. Ocean-going steamers can reach Hankow, and smaller steamers can pass up to Ichang, 1,000 miles from the coast. Shanghai, the port of the Yangtze, is not on the main stream, but on the Wusung distributary. It has important cotton mills and factories of various kinds.

The most important part of South China is the Sikiang valley and the Canton delta region, a rich area producing sugar cane, silk and rice, while tea is grown mainly further north in the hilly region facing the Strait of Formosa. The island of Hongkong, with a part of the adjacent mainland, forms a British Crown Colony. There is a very good harbour, and Hongkong is an important naval station. In parts of South China, particularly in the mountainous province of Yunnan, minerals are abundant.

To what has been already said in regard to Manchuria it may be added that it is capable of producing cereals such as wheat and also soya beans, which have become very important in recent years. There are also minerals, including coal and iron, and forests, and the region is well fitted to supplement the food supplies of China.

The capital of China is now Nanking in the Yangtze valley, instead of Peking in the north, and the country is undergoing great changes.

See Roxby, "Distribution of Population in China," *Geographical Review*, January, 1925; Bishop, "Development of Chinese Civilisation," *ibid.*, January, 1922; Buxton, *China*, Oxford, 1929. Roxby, "The Expansion of China," *Scott. Geo. Mag.*, March, 1930.

JAPAN

THE JAPANESE LANDS. The nucleus of the Japanese Empire is formed by the four larger islands of the archipelago which girdles the Sea of Japan. Of these the mainland, Honshu (Hondo), is comparable to Great Britain in size, the northern island of Hokkaido is rather smaller than Ireland, and the two southern islands of Kiushu and Shikoko together reach more than half the size of Ireland, making a total area of 137,000 square miles. This may be thought of as equal to the British Isles plus an area half the size of Ireland. The population of the archipelago is over 60 millions, and thus considerably denser than that of the British Isles. The addition of Chosen (Korea),

Taiwan (Formosa) and Japanese Sakhalin or Karafuto, with the smaller islands, almost doubles the area, making the total 261,000 square miles, and increases the population to $83\frac{1}{2}$ millions, the density being less in these newer territories.

CONTRASTS WITH CHINA. China and Japan are so constantly associated together that it is well to notice some of the contrasts between them. The extreme southern point of Kiushu does not reach 30° latitude, and may be said to be in the latitude of Shanghai. The northern point of Honshu extends beyond 40° N, that is, north of the latitude of Peking, while the relatively unimportant island of Hokkaido extends north of 45° . Thus Japan corresponds in latitude to North China and Manchuria. The islands are narrow in proportion to their length and are highly mountainous, giving no room for the development either of the great rivers or the extensive plains of the continent. The loess deposits of North China are absent, and cultivation is limited to the valleys and the mountain slopes, and is even more intensive than in China. The soil, usually volcanic, is often highly fertile, but Japan suffers severely from its volcanic nature and its position along a line of weakness in the earth's crust. Earthquakes are of constant occurrence; one or more shocks takes place on the average every day, while severe quakes are to be expected every six and a half years. The light bamboo houses and furniture are a response to this perpetual menace. Volcanic eruptions are also frequent, and the south and west coasts are liable to be visited during August and September by typhoons or destructive hurricanes which may devastate the rice crop. On the other hand the mountainous form means that the coast-line is rich in harbours, and the sea plays an even greater part in the life of the people than it does in South China, almost all the important towns are sea-ports, and sea-fisheries—in the wide sense—supply the greater

part of the animal food consumed in Japan, pigs not being nearly so extensively reared as in China. One of the motives of Japan's extension northwards, as into Karafuto and the Kurile Islands, has been the desire to extend the national fishing-grounds.

As compared with North China at least, also, Japan is much more heavily forested, half the surface being still under wood. As far north as about the latitude of Tokyo the woods are of the sub-tropical evergreen type, the milder winters and damper climate of Japan extending the range of these forms as compared with China. Further north deciduous trees appear, mingled with evergreens at the greater elevations, but deciduous trees extend northwards even into Karafuto. The forests form the basis of a great number of industries, now often of western type, such as matchmaking, based, as in Europe, especially upon aspen and poplar wood, and paper pulp in Hokkaido. Interesting trees are camphor, present particularly in Taiwan, but also in the southern islands of the archipelago, the laequer tree, the paper mulberry, the bark of which, as in China, is used for paper-making, and of course the invaluable bamboo. Areas unfitted for the growth of forests are usually covered with spiny grasses, quite unsuited for fodder. The government has made great efforts to improve the breeds of cattle and horses and to introduce sheep, but with no great success, owing to the absence of pasture.

The climate of Japan is somewhat less continental than that of China in similar latitudes, while the ocean currents and the mountainous nature of the islands result in a considerable difference between the east and west coasts. One branch of the Kuro Sivo, the warm current of the North Pacific, washes the west coast, while a branch of the cold Okhotsk current passes south along the east coast. Winter temperatures are therefore higher on the west than on the east, and the north-east of Honshu is particularly cold in winter. A further effect is that the

cold north-west winds of winter, which blow from the Asiatic mainland, are warmed by crossing the Sea of Japan and pick up moisture there. Thus the west coast of Honshu receives heavy winter rains, the precipitation during the three winter months being greater than during the three summer ones. By the time they reach the east coast these winds are at once dry and cold, so that there is little winter rain there. On the other hand, the south and east coasts receive heavy rain from the south-east monsoon of summer. A peculiar feature is that these rains tend to be heaviest in June and September, with a somewhat drier intervening period in July and August. The June rains are particularly important for the planting of the rice crop, and in some parts quick-ripening varieties are grown which can be harvested before the onset of the September rains. Though less productive than the varieties which have a longer growing period, the short-season crops are a means of avoiding the damage often done by the typhoons of September with their accompanying heavy rain.

Rice is the main cereal crop, and frequently alternates with winter crops of wheat and barley, sown in September or October and cut in May. As in China, a great variety of vegetables is grown, beans and other pulses being very important. Apart from food crops, the main products are tea and silk, cotton being little grown. Tobacco is important, and attempts have been made to grow sugar beet.

MODERN JAPAN. Japan received its civilisation from China by way of Korea, but since the awakening in 1868 has absorbed Western ideas and technique with great rapidity, and has reversed its former rôle of learner, and acquired great economic influence in China. A process of political expansion has been rapid, and has been accompanied by great industrial developments. In regard to the directions of the expansion, it has to be noted that the numerous harbours and the fact

that, until the construction of railways, the mountains of Honshu made communication between the east and west easier by sea than by land have made the Japanese a nation of seafarers. With the introduction of steamships the advantages of position of this Britain of the Pacific were exploited to the full. Yokohama, the port of Tokyo, the capital, is in about the same latitude as San Francisco, from which it is distant some 5,000 miles. The fact that Japan holds a mandate from the League of Nations for the formerly German Pacific islands of the Pelew, Caroline, Marshall and Marianne groups is an indication of her interest in Pacific routes and Pacific trade. Guam, the largest of the Marianne Group, had been previously ceded by Spain to the United States, the power which also holds the Philippines and the Hawaiian Islands.

The Russian port of Vladivostok lies in the same latitude as the southern part of Hokkaido, and Japan watched with jealousy the Imperial Russian threat to Manchuria. After the Russo-Japanese War the southern part of the peninsula of Liaotung, with Port Arthur and Dairen, was taken over from Russia by Japan, which leases the region from China. Japanese interests in Manchuria are now great. Korea was annexed by Japan in 1910; its position in relation to Honshu should be noted. Formosa was obtained from China in 1895, and its proximity to the richest part of South China is important.

These extensions of territory were not only important as giving a growing carrying trade to Japan, but as a means of increasing supplies of food and raw material, and thus liberating more labour for industry in the motherland. Korea produces cotton, rice and beans as well as gold; Formosa, cane sugar, tea and camphor; Manchuria yields large amounts of soya beans. The new industries in Japan proper tend to be of the factory type as contrasted with the old home crafts. This change-over is aided by Japan's resources in coal, especially in

Kiushu and Hokkaido, though Japanese coal is not as good as Chinese. Ozaka (over 2,000,000) has a large cotton industry; Nagasaki exports coal and has ship-building yards; Tokyo (under 2,000,000) and the old capital of Kioto carry on a great variety of industries.

Essentially Japan is thus a small, mountainous, volcanic and relatively unproductive archipelago—only some 12 per cent. of the surface being arable—whose inhabitants have taken advantage of an admirable position between marginal seas bordered by lands of great but imperfectly utilised resources, and a vast ocean in process of becoming a world highway. Large-scale industry and overseas trade are the keynotes of its modern development.

INDO-CHINA AND THE MALAY ARCHIPELAGO

THE PENINSULA OF FURTHER INDIA. Between India and China lies the peninsula of Indo-China or Further India, in latitudes comparable to those of India, but continued nearly to the equator in the long and narrow secondary Malay peninsula. The main peninsula is divided into Burma, administratively, as we have seen, part of India; the independent kingdom of Siam; and French Indo-China. The whole area has a comparatively small density of population, and has no independent culture of its own, but has been influenced in its different parts by both the adjacent countries of India and China. Both facts have an obvious geographical basis in the nature of the mountains which traverse the peninsula.

As already seen, the fold-mountains of Central Asia bend to the south at the eastern end of the Tibetan plateau. There is a narrowed waist between the Brahmaputra and the Upper Yangtze, where the great rivers run in steep-sided, parallel gorges, but thereafter the mountains splay out, as it were. Three main sections can be recognised:—the Arakan Yoma in Western Burma; the Shan Mountains of the centre, continued into the Malay

peninsula ; the crescent-shaped mountains which fringe the coast of Annam. Clearly, then, there is no separation of a definite unit from the continental mass such as is produced by the Himalaya in the case of India, and, if less markedly, by the plateau edge in the case of China. The hollows between the folds are occupied by a series of rivers, the Irrawaddy, the Salween, the Menam and the Mekong, with the Red River in the north-east. The Irrawaddy is an important waterway, and the Red River is navigable above its delta, but the others are much interrupted by rapids. The lower valleys of the Irrawaddy, Menam and Mekong are well-fitted for rice production, and their ports, Rangoon, Bangkok and Saigon, export this commodity largely. But the wide areas of swamp land, and the difficulty of organising strong states in the face of constant inroads by the mountain folk, cut off by no easily defended line, has prevented the rise of a productive system of agriculture, and of an indigenous culture.

Siam has an area of about 200,000 square miles, with a population of 9 millions (contrast Japan). Rice and teak are exported and the mineral resources are extensive and varied, tin being the most important. Bangkok is the capital and only large town. Siam extends into the northern part of the Malay peninsula, as does also Burma. In about latitude 10° , in the so-called isthmus of Kra, there is a curious "kink" in the trend of the mountains, associated with a remarkable gap, the land within it scarcely rising above 100 feet. Here it has been proposed that a ship-canal should be constructed, to shorten the distance between Rangoon and Bangkok and between Calcutta and Hongkong. South of this gap the Malay peninsula resembles the islands of the archipelago much more than Indo-China proper.

French Indo-China has an area of 275,000 square miles, with a population of about 20 millions. It consists of the colony of Cochin China, with the protectorates of

Annam, Cambodia, Tonking and Laos. Rice is again the main product, but the fisheries are rich.

South of the isthmus of Kra the Malay peninsula is mountainous and forested, with a climate equatorial rather than monsoonal, for there is no pronounced dry season and little variation in temperature throughout the year. Three sets of facts give the region great economic importance. These are the suitability of climate and soil for many kinds of equatorial plantation produce, particularly rubber; the mineral wealth, tin being much the most important mineral worked; the unrivalled position of the southern ports, which command all the traffic through the Strait of Malacca, and thus between the Indian and Pacific Oceans, between China and India. The tin mines have been worked and the rubber plantations initiated by British enterprise, and British influence is paramount, though the actual political relations are somewhat complicated. Originally the inhabitants were mainly Malays, but many coolies from China and South India have come in to work in the mines and on the plantations.

The island of Singapore, at the eastern exit of the Strait, the island of Penang commanding its northern entrance, together with strips on the south-west coast, form the British Crown Colony of the Straits Settlements. Four states, including the great tin-producing region of Perak, form the Federated Malay States under British protection. Four other states, though outside the Federation, are also under British protection, and the independent state of Johore, in the extreme south, has accepted a modified form of protection. In addition to rubber, rice, coconuts, sugar, tapioca, pepper and many other crops are grown and exported. Singapore is a great entrepôt for Far Eastern trade and a coaling station, while Penang exports much of the tin of Perak.

THE MALAY ARCHIPELAGO. The islands of the Malay Archipelago may be conveniently regarded as falling into

three groups, the Philippines to the north, the central group crossed by the equator and including Borneo, Celebes and the Moluccas, and the festoon of the Sunda islands, consisting of Sumatra, also crossed by the equator, Java and the Lesser Sundas. North Borneo is British or under British protection ; part of the island of Timor, one of the Lesser Sundas, is Portuguese ; the Philippines belong to the United States ; but the remainder form the rich colonial possession of Holland (cf. p. 69).

The islands yield valuable minerals and a great variety of tropical products, and except for Borneo are remarkable for the number of active and extinct volcanoes. But geographically perhaps the most interesting point is that they appear partly to confirm and partly to disprove the common belief that equatorial lands are enormously productive, and thus densely peopled. Java, with the adjacent island of Madura, is practically the same size as England and contains 37 million people, giving a density of over 700 per square mile, enormous for a purely agricultural area. The Philippines, covering about twice the area, contain over 10 million people, with a density of over 100 per square mile. But Celebes, about one and a half times the size of Java, has only a little over three million people, with a density of about 45, and some of the smaller islands and part of Dutch Borneo have less than 10 persons per square mile. The high density in Java is due partly to the fertile volcanic soil, the absence of the swamps so extensive in, e.g. Eastern Sumatra, and the ease with which irrigation can be carried out. But this is not the whole story. Those of the islands which lie close to the equator tend to be covered by dense forest, owing to the high and practically continuous rainfall. With distance from the equator there is a tendency for a dry season to appear, and the dense forest gives place to open woods and grasslands, where cultivation is much more easily initiated. The



PART OF THE TEMPLE OF BOROBUDUR ("THE GREAT BUDDHA") IN JAVA

The temple is a relic of the early Hindu occupation of the island. Its foundation is stated to date from the 7th century, and it is one of the most remarkable existing examples of Buddhist architecture.



RUBBER PLANTATION IN BRITISH NORTH BORNEO

The trees are *Hevea brasiliensis*, introduced from the Amazon basin.

7

eastern half of Java has vegetation of this type, and was occupied in the early centuries of our era by immigrants from India, who introduced rice culture. Though that early civilisation was overwhelmed, the rice lands served as a starting-point from which cultivation could spread to the more heavily wooded western end of the island, and cultivation has been greatly extended and improved by the efforts of the Dutch. Luzon, in the Philippines, is similarly in parts not heavily wooded, but the Spaniards did less here than the Dutch have done in Java.

Luzon is the most developed island of the Philippines, containing Manila, the chief town. Manila hemp, obtained from the leaf fibres of a plant related to the banana, tobacco, cane sugar, rice, coconuts and some rubber are the chief products of the group. British Borneo yields coal and petroleum; cutch, a tanning material obtained from mangrove; tobacco, rubber and many other plantation and jungle products. The Dutch East Indies centre round Java, by far the most important island, with its capital of Batavia. Java produces rubber, sugar, tea, now more important than coffee, cinchona (quinine), cocoa and many other crops, as well as some petroleum. Sumatra is mainly important for its tobacco and coffee and its minerals, including coal and petroleum, while Banka and Billiton, two islands off its east coast, produce very large amounts of tin. Celebes yields coffee and cocoa, and the Moluccas, or Spice Islands, are still important for their spices, especially cloves and nutmegs.

CHAPTER XII

LANDS OUTSIDE THE MONSOON BELT

SIBERIA

WE may conveniently use the name Siberia to include both that part of northern Asia which drains towards the Arctic Ocean, and also that north-eastern area which confronts the Bering Sea, the Sea of Okhotsk and the Sea of Japan, and is included like the former within Soviet Russia. This vast and for the most part thinly peopled territory presents two main points of interest. From the internal standpoint it is a region of great and largely undeveloped natural resources, handicapped by difficulties of communication. From the world standpoint it is of importance because only in Siberia is there a transcontinental Asiatic railway, and outside the region land routes between the densely peopled lands of the Far East and Europe or Western Asia are slow and very difficult.

COMMUNICATIONS AND PRODUCTS. As regards internal communications Siberia is remarkable, despite the generally low rainfall, for its large rivers, which in the summer season carry great amounts of water seawards, since little of the rainfall is lost by evaporation. Four of these rivers are of outstanding importance. These are the Ob, Yenisei and Lena flowing to the Arctic Ocean, and the Amur entering the Sea of Okhotsk. All for parts of their courses are of high value as navigable waterways during the warmer season ; all suffer from the great disadvantage that they enter seas which are practically of no economic value owing to the way in which navigation

is impeded by ice. The three first also, owing to their south-to-north direction, which means that the winter ice melts in the upper reaches while the lower are still blocked, give rise to dangerous floods in late spring, and turn large tracts of land into useless swamps.

But if the great rivers do not, or only to a very minor extent, serve as outlets for Siberia to the seas of the world, they and their larger tributaries are of vast importance as highways within the country. In pre-railway days the tendency was for towns to be placed in such a position on the rivers that the maximum use could be made of the navigable waterways. Examples are Tobolsk, placed where the Tobol and the Irtysh unite, the united stream flowing north to the Ob, and Tomsk, on another tributary of the Ob, not far from its junction with the main stream. Since the construction of the railway the tendency has been for the towns placed where the railway crosses a navigable waterway to grow at the expense of those more remote from the trunk line. Thus Omsk (160,000) on the Irtysh is now the largest town in Siberia; Krasnoyarsk, placed where the railway crosses the Yenisei, is another example. Within Siberia indeed the Trans-Siberian may be said to tend to cross at right angles the mainly longitudinal lines formed by the great rivers, and to collect at the market centres the goods which have been brought there by water. The absence of a railway net, the main line having few branches except in the extreme west and extreme east, and further the fact that even when Siberia is left a long haul through European Russia is necessary before a suitable port can be reached, is a great handicap to Siberian trade. It is further a disadvantage that it is the lands of western Siberia which are best fitted for agricultural development, and as compared with the similar lands in Canada they have great difficulty in reaching a world market. Though well fitted for wheat production, and though much wheat is produced, these lands are tending to concentrate on dairy

produce, notably butter, which being relatively valuable in relation to its bulk will stand transport to a distant market. This tendency for Siberian exports to be goods of high value and small bulk is indeed general. They include furs from the taiga, or forest belt, mammoth ivory from the tundra, where these extinct hairy elephants are found embedded in frozen earth, and the more valuable minerals, such as gold and silver. Local trade, on the other hand, carried on as it is chiefly by water, is largely in more bulky and less valuable farm produce. Siberia has great mineral wealth, but much of this is as yet unutilised.

Apart from its great importance in connecting Siberia to the railway system of Europe, we have to consider the Trans-Siberian (Fig. 26) as a through route, linking the Far East and particularly Manchuria, Korea and China to Europe. On Omsk converge two trunk lines, one from Ekaterinburg and the other from Chelyabinsk. The railway then runs east to Krasnoyarsk, and turns to the south-east past Irkutsk to round Lake Baikal, whence it runs east to the junction of Chita. The original route was then through Manchuria to Harbin and so to Vladivostok. But Russian influence in Manchuria diminished as the result of the Russo-Japanese war, and a route which avoids Manchuria has been constructed, running north of the river Amur, and then bending southwards after crossing the river at Khabarovsk to reach Vladivostok. From Harbin a line runs south to the important junction of Moukden, whence three routes diverge. One runs south-east to connect with the Korean railways, one south to Port Arthur and Dairen, and the third south-west to Peking and so to the Chinese railway system. These complicated eastern connections give the Trans-Siberian great importance for through passenger traffic and for costly goods like tea and silk. Vladivostok is closed by ice for about four months of the year, hence the Russian

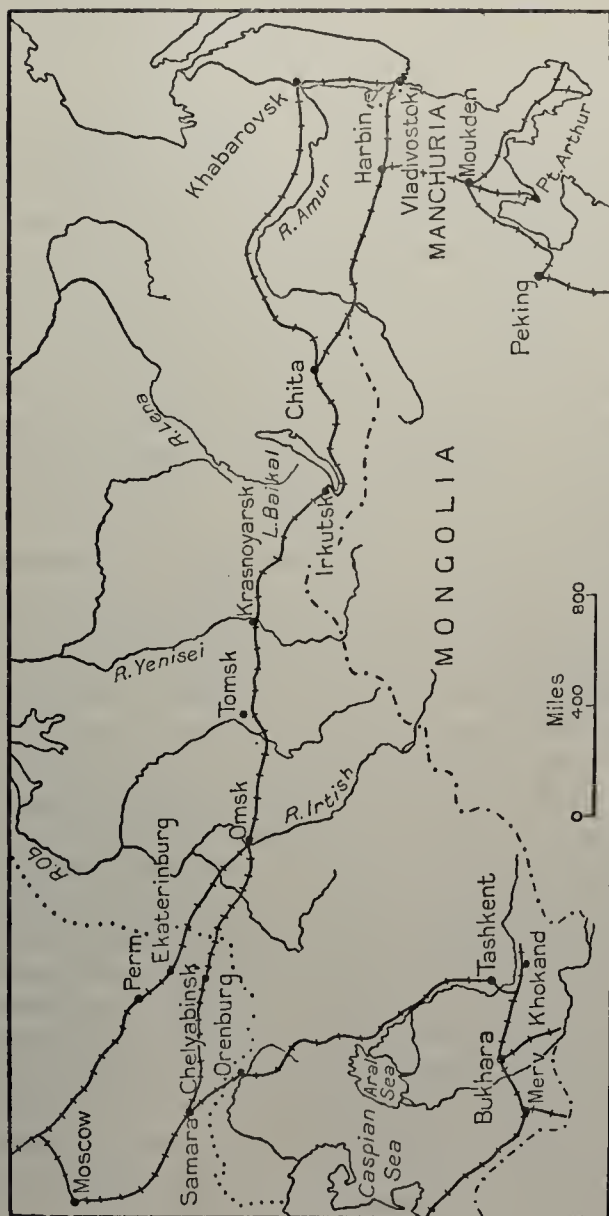


FIG. 26.—THE TRANS-SIBERIAN RAILWAY AND ITS CONNECTIONS.

desire to have and to hold Port Arthur and Dairen (p. 200).

TURAN

The remainder of Asiatic Russia, outside Siberia, falls within the great stretch of arid land which may be called Turan. It is bounded to the north by the low swelling (p. 158) of the Kirghiz steppes in which the rivers of Western Siberia take their rise ; to the east by the Tien Shan and Pamirs ; to the south by the border ranges of Persia and Afghanistan ; to the west by the Caspian Sea. From the western shore of that sea a strip of territory lying south of the Caucasus, and including the republics of Azerbaijan, Georgia and Armenia, extends to the Black Sea. This strip for all practical purposes is included within Russia.

Much of Turan appears in geologically recent times to have been covered by the sea, and three bodies of water remain, forming the Caspian Sea (85 feet below sea-level), the Aral Sea (158 feet above sea-level) and Lake Balkhash (about 800 feet above sea-level). All are basins of internal drainage and therefore salt, and the whole region has a very low rainfall. But the rivers, fed by the snows of the eastern and southern mountains, carry a considerable amount of water which is available for irrigation purposes. The Ili succeeds in reaching Lake Balkhash (Fig. 27), and further west two powerful trunk streams, the Sir Darya and the Amu Darya (Oxus); enter the Aral Sea by large deltas. The Zerafshan, theoretically a tributary of the Oxus, sinks into the sand before reaching that river. To the south the streams, which have smaller catchment basins, similarly sink into the sand after a short course in the lowlands. The Murghab is the most interesting of these. To the north a number of minor streams flow south from the water-parting of the Kirghiz steppe region, but none succeeds in reaching either the Aral Sea or the Sir, all dying away in small lakes.

This account of the drainage gives the key to the use which can be made of the lands. The centre is desert or semi-desert. The northern steppes afford much pasture in spring, but are dry in summer and cold in winter. Pastoral nomadism, with long-range migrations, is thus essential, and the Kirghiz are the typical occupants of this northern region, depending entirely on their flocks. But to the south-east intensive cultivation is possible where irrigation water can be obtained from the rivers. One of the outstanding contrasts indeed between Russian and Chinese Turkistan, between the lands east and west of the Pamir and Tien Shan borderland, is that in Russian Turkistan these two types of life are possible, while the aridity is so extreme in Chinese territory that only oasis cultivation is possible, and pastoral nomadism cannot exist on the same scale. In the Russian lands also the areas capable of irrigation are larger and carry a heavier population.

In particular the upper Sir, in the region called Ferghana, with the towns of Khokand and Andijan, is highly productive, yielding large amounts of cotton. The cotton is sent to Moscow for manufacture, and so much progress had been made before the period of disturbance due to the war that Russia was within measurable distance of producing sufficient cotton to supply her own needs. Lower down the same river valley Tashkent (320,000), on a tributary ranks as one of the great Russian cities. On the Zerafshan, Samarkand upstream, an ancient city with many relics of the past (Plate VI), and Bukhara, further down, are both important. It is the use of irrigation water in their neighbourhoods which accounts for the disappearance of the Zerafshan river. Khiva, well out on the plain, is irrigated by feeders of the Amu, while Merv, at the end of the Murghab, absorbs all the water of that river.

In early days Turan was of importance as a passage-land, since it was possible by difficult routes to reach from

it India and distant China. The Terek pass (about 12,500 feet), for example, makes it possible to reach Kashgar from Tashkent. Land traffic between European Russia and China being now carried on mainly by the Trans-Siberian railway, these old routes are of little significance. But with Russian development of the irrigated areas of Turan, the region has been closely linked by rail to Russia in Europe. From Krasnovodsk, on the Caspian Sea, a line runs near the base of the southern mountains past Merv to Bukhara and Samarkand, and then to Khokand and Andijan. There is also a branch to Tashkent, and from Tashkent there is railway connection to Orenburg (Fig. 26) and so by Samara to Moscow. Krasnovodsk, again, is connected by steamer with Baku, on the west coast of the Caspian, the great oil centre. Baku, with its valuable oil-wells, is linked both by railway and by a pipeline to Batum on the Black Sea. Turan has thus effective connections both with the European railway system through Moscow and also with the Mediterranean sea-ways through Batum, and has lost much of its earlier isolation.

CHINESE CENTRAL ASIA

This consists of three great territories, Sinkiang, or Chinese Turkistan, Mongolia and Tibet. All are arid and scantily peopled, with at best but limited agriculture.

Sinkiang is divided by the Tien Shan Mountains into a smaller northern and a larger southern part. It is convenient to give the names of Dzungaria and Kashgaria to these two sections, though politically there is no longer a Dzungaria. It was once an independent state placed in a part of Central Asia where movement from east to west is relatively easy, and though its lands are now divided between Sinkiang, Mongolia and Russian Central Asia, its position is important. East of Lake Balkhash (p. 210) there is a wide space between the Altai Mountains to the north and the Tien Shan to the south. The space must

not be thought of as an open gap, for mountains are present, including the Tarbagatai group. But these are easily crossed at various points, and, what is perhaps even more important, open steppe country, not desert, extends well into Sinkiang (Fig. 27). This Dzungarian Gate served as a route through which in earlier days the nomadic peoples of Central Asia, Mongols and Tartars, poured westwards, ultimately to reach Europe (p. 126), one of the motives being that the land became progressively less and less arid as they travelled towards the setting sun.

The natural line of movement from the east is along the northern base of the Tien Shan, where water is available, and this route, which comes from China proper (p. 182), has always been a trade route. It is now of minor importance, but it is possible that it may some day be traversed by a railway. Urumtsi, the administrative centre of Sinkiang, lies on this route. The town also commands a pass over the Tien Shan, and is thus connected to that other road from China which passes south of these mountains, via the Turfan depression, to Kashgar. From Urumtsi the northern road is continued to Kuldja, placed on the river Ili, which flows across the frontier between Chinese and Russian territory to enter Lake Balkhash.

In Sinkiang south of the Tien Shan, the most important element is the ring of oases towns lying at the base of the mountain rim. The size of these towns depends on the amount of irrigation water obtainable from the streams which water them, and the strongest streams are those which flow from the Pamirs and the Karakoram range. Thus the towns of Kashgar, Yarkand and Khotan are the equivalents of the similarly situated towns on the western or Russian side of the mountains. They are watered by streams which unite to form the Tarim river, which finally dies away in the Lop Nor Lake. South of the Tarim lies the Takla Makan desert, one of the driest parts of the earth's surface, and in the Tarim basin itself

the sand dunes are constantly advancing westward, and have overwhelmed ancient cities which formerly thrived here. Kashgar, as already seen, has routes leading to Turan, and owing to its connection with China was once on a great trade route between east and west. Yarkand, on the other hand, trades mainly with Kashmir and India over the lofty Karakoram pass (p. 172).

Mongolia, from the human standpoint, may be said to be that part of the rim of the Gobi desert which yields pasture enough to support the flocks of sheep, camels and horses reared by the nomads. Such pastures are most abundant to the north and to the east, and in the east there has been a certain amount of penetration by Chinese agriculturists, since light summer rains occur. Caravan routes cross the desert, and the chief permanent settlements are in the north, where they serve as centres of trade with Siberia. Thus Urga, the chief town, is connected to Kalgan (p. 182) by a route which can be used in summer by motor cars. Urga lies 170 miles from the Siberian town of Kiakhta, placed about one hundred miles south of Lake Baikal.

Tibet, lying at an elevation of 9,000–14,000 feet, and forming the most extensive high plateau in the world, has necessarily a very bleak climate, so that little agriculture is possible. The population is mostly settled in the south, in the main and tributary valleys of the Sanpo or Brahmaputra. Lhasa, the capital, stands on one of the northern tributaries. In the valleys cereals, such as barley and wheat, vegetables, notably peas, and occasionally even fruit can be cultivated, but the Tibetans are mainly pastoralists, rearing especially yaks, sheep and goats. The yak is a kind of ox, peculiar to Tibet, and of enormous importance in the life of the people. Like sheep and goats it is used as a transport animal, being remarkable for its great agility and endurance of cold. Most of the body is covered with close, short hair from which cloth can be woven, but the special feature is the



FIG. 27.—PART OF CENTRAL ASIA, TO SHOW THE ANCIENT CITIES AND NATURAL TRADE ROUTES. The mountains are cross-hatched. 1. The Altai; 2. The Tarbagatai and other mountains which partly close the Dzungarian Gate; 3. The Tien Shan; 4. The Pamirs; 5. The Hindu Kush; 6. The Karakoram. The dotted areas are the true deserts, the unshaded areas represent the steppes and steppe deserts.

long silky hair which fringes the limbs, the sides of the body and the tail. This long hair is spun into ropes, and used to make tent covers, and yak tails, with their plumes of long hair, are greatly prized in China and elsewhere as fly-whisks and also as streamers, being mounted on long poles like flags. The yak further yields very rich milk from which butter is made, this being a very important article of diet because of the coldness of the climate. The Tibetans drink large quantities of tea, which has to be obtained from China by difficult routes in the form of "bricks," or compressed blocks, and yak tails and goods manufactured from yak hair are among the commodities offered in exchange.

SOUTH-WESTERN ASIA

We may include here the great crust-block of Arabia, the Tigris-Euphrates valley area which forms the kingdom of Irak, and the plateau of Iran. The last is divided politically into the independent states of Persia and Afghanistan, and that of Baluchistan, which is partly under British control as an Indian dependency and in part governed by a native khan. Asia Minor, Syria and Palestine are omitted, as they have been already briefly discussed (p. 151).

South-western Asia in this sense shows from the human standpoint considerable resemblances to Central Asia. Aridity is again the prevailing note, and Arabia in particular has in the past resembled Central Asia in serving as a reservoir from which warlike nomadic peoples have streamed outwards to better-watered areas. A further resemblance lies in the fact that in the past south-western Asia, like Central Asia, was traversed by important land-routes to the Far East, routes which have now lost much of their significance. But whereas in the case of Central Asia the old, difficult caravan routes have been largely replaced by the Trans-Siberian railway, in



YAK NEAR GYANTSE, TIBET

The domestication of this wild ox, which feeds exclusively on the tough, wiry grass of the high plateaux of Central Asia, may be said to have made human life possible there.
Photo by Col. F. M. Bailey.

the south-west the continuous waterway formed by the piercing of the Suez Canal has led to the shifting of traffic to the ocean route.

Very important land-routes, at various periods of history, led from the ports of the Syrian coast to the head of the Persian Gulf, and the uncompleted Baghdad railway was intended to replace those old routes by a modern line of communication which would have greatly shortened the journey from Western Europe to India. But though motor cars now run from Haifa and Beirut via Damascus to Baghdad, and there are also air-lines, it cannot be said that the supremacy of the Suez Canal route is as yet seriously threatened.

Arabia consists mainly of arid tablelands rising to heights of over 3,000 feet, bordered by flat coastal strips. Yemen or Arabia Felix in the south-west receives a fair amount of summer rain and is fertile. It was the original home of Mocha coffee, the plant being carried thence to Java by the Dutch. But though conditions are ideal for coffee-growing here, Yemen does not now export any large amount of coffee, Brazil being much the largest producer. The fact is interesting because it is generally true that when a great demand arises for a commodity which cannot be produced in Europe or lands of similar latitudes, this demand cannot be met by the area in which the plant concerned was native, or where it was first grown extensively. Coffee, tea, rubber, cinchona (quinine) may be mentioned as examples. In all such cases the tendency is for plantations to be established by Europeans in areas often remote from the first source of supply, the plantations ensuring a large and steady output, and well-organised export.

Apart from Yemen and from Oman in the south-east, little cultivation is possible in Arabia except in the oases, where the date-palm is particularly important. Many of the inhabitants are nomadic, rearing large numbers of camels, horses and sheep. But since many ports are

present on the three Arabian coasts, the Arabs have always been fearless sailors and expert traders, thus supplementing the scanty products of their lands.

Jidda is the port of the sacred city of Mecca, also reached by a pilgrim route from Medina, the terminus of the Hejaz railway, which is connected to the Baghdad railway at a point north of Aleppo. Hodeida is the port of Sana, the chief centre of fertile Yemen, placed in the interior at a height of nearly 7,500 feet. Aden, on the south coast, about 120 miles east of the Strait of Babelmandeb, has been British since 1839, and is a very important fortified coaling station on the way to the east. It has a good harbour, and this, combined with a position where frequented ocean routes converge, is its only natural advantage.⁶ The actual settlement, which includes the island of Perim at the mouth of the Red Sea, and is attached to the government of Bombay, is barren. Food for man and beast, firewood and coal have all to be imported, and water is also deficient, so that it has to be obtained by distilling sea-water. Aden indeed forms an admirable example of what is called an *entrepôt*, a centre which on account of an advantageous position imports goods not for local use but for export. A large amount of produce is brought by caravan from the interior, and much is also sent from British Somaliland opposite, but most of Aden's trade is in commodities brought from East African or Far Eastern ports, exchanged for goods brought from Europe and left for redistribution. Another Arabian port of some interest is Kowcit, on an inlet in the north-western part of the Persian Gulf. This is under British protection and may become in the future an important centre.

Irak, or Mesopotamia, has as its capital Baghdad, placed at the point where the Tigris and Euphrates approach one another, the region being one where historic cities have always tended to rise (cf. Babylon). At present Irak is of minor importance, but it is believed that with a revival

of effective methods of irrigation it may become a great producer of cotton and other crops. Dates are grown on a considerable scale and exported from Basra, the port on the Shat-el-Arab, or united Tigris and Euphrates. The Tigris is navigable by river steamers up to Baghdad, and smaller boats can reach Mosul. The navigation of the Euphrates is difficult. The railway extends from Basra to well beyond Baghdad, but there is a wide gap in the region round Mosul.

Persia is the most important part of the plateau of Iran. The Elburz Mountains in the north and the Zagros in the west have a heavy snowfall, which makes irrigation possible, but large tracts of pure desert occur towards the east. Communications are everywhere very difficult, so that Persia is remarkably isolated. The Karun, which enters the Persian Gulf, being united by a branch with the Shat-el-Arab, is the only navigable river. The port of Mohammerah, on this branch, is increasing in importance, particularly because of the activities of the Anglo-Persian Oil Co., which is developing the oilfields of the Zagros slopes. The relation of this oilfield to the development of a tin-plate industry in Bengal is noted on p. 184. A pipe-line runs from the vicinity of Mohammerah to oilwells beyond Ahwaz on the Karun river. Tehran, in the north, is the capital of Persia, which, apart from petroleum, exports carpets made by hand from the fine local wool, silks, pearls from the Gulf and horses. Afghanistan resembles Persia, but is even more backward.

An account of the historical importance of Mesopotamia will be found in the author's *Mediterranean Lands* (London, 1924). Ellsworth Huntington's *The Pulse of Asia* (1908) gives an interesting account of Chinese Central Asia.

PART III
AFRICA

CHAPTER XIII

GENERAL SURVEY OF AFRICA

POSITION AND RELATIONS. Africa forms part of the Old World land-mass, for the Suez Canal is but an artificial ditch, and the narrow Strait of Gibraltar is of geologically recent origin. It is, therefore, all the more remarkable to find that historically by far the greater part of the continent has always been aloof and remote. It shows considerable apparent resemblance to South America, both continents being crossed by the equator; but in detail the contrasts are very great. Though large river systems are present, the Nile being the second longest river of the globe after the Mississippi, access to the interior is difficult and good ports are few. Despite its large rivers, also, about one-third of the total area is without direct drainage to the sea, and there is a remarkable absence of those large river plains which in Asia and the Americas have proved so well fitted for dense settlement. Generally, indeed; it may be said that with the partial exception of Australia, Africa of all the continents has proved most resistant to man's efforts to control nature.

The continent has an area of about $11\frac{1}{4}$ million square miles, approximately two-thirds of that of Asia, but contains less than one-seventh of the population, about 134 millions as against over 1,000 millions in Asia. In position it may be said to be the most tropical of the continents, for it extends from about latitude 37° north to nearly 35° south, and since the area north of 35° north is very small, for practical purposes it may be said to extend an equal distance north and south of the equator. In shape

it is peculiarly compact. Except for the Gulfs of Gabès and Sidra on the Mediterranean coast, and the large Gulf of Guinea, there are no marked inlets, and the Somaliland peninsula is the only notable prolongation of the coast. Islands also are remarkably few. The Gulf of Guinea marks the transition between the wide northern section, practically continuous with the crust-block of Arabia across the narrow Red Sea, and actually continuous in the Sinai peninsula, and the triangular southern section. Owing to the desert barrier the isolation of the southern section was not broken down till man had conquered the difficulties of ocean navigation, and its attachment to the rest of the world is still incomplete.

STRUCTURE AND RELIEF. The outstanding structural feature is that, save for the narrow belt in the north-west traversed by the Atlas Mountains, no young folded mountain chains occur within the length and breadth of the continent. The great earth storm which moulded so much of Europe and Asia, and profoundly influenced the surface there, had scarcely any effect in Africa, which is essentially a gigantic crust-block. This is especially true of the more elevated southern section, which has apparently remained standing above sea-level for a very prolonged period of geological time. The eastern side of the continent, however, seems to have responded to the great mountain-making movements in Asia by extensive faulting, accompanied as usual by great outpourings of volcanic material. The two processes have altered the land-forms and modified the drainage conditions there. A great Rift Valley, apparently a continuation of that of Syria, extends from the end of the Red Sea to Lake Nyasa, its surface being marked by lakes of which the most conspicuous is Lake Rudolf. Another similar rift, occupied successively by Lakes Albert, Edward and Tanganyika, lies to the west and converges towards Lake Nyasa. Both arms consist of blocks of land which have sunk between parallel faults, and the margins show great

volcanic mountains; such as Elgon, Kenya and Kilimanjaro, the latter, the highest point in Africa, rising well over 19,000 feet. Further north the high plateau of Abyssinia is similarly built up of a great mass of volcanic rocks. Even apart from these volcanic masses, however, the African plateau reaches a greater height and continuity in the east and south than elsewhere. In the centre it forms the East African Highland from which rise the volcanic mountains already named, and also the great massif of Mount Ruwenzori (nearly 17,000 feet), between Lakes Albert and Edward. In the extreme south it is broken off sharply at the seaward edge both to the east and west, leaving a very narrow coastal plain. In the south-east the broken edge of the plateau presents the appearance of a mountain range, and is called the Drakenberg.

DRAINAGE. The absence of a continuous mountain range, and the plateau shape, have greatly affected the course of the rivers, which mostly reach the sea after following very indirect courses on the surface of the plateau, and being much interrupted by rapids. The dryness of the climate over great areas also, and the presence of the branched Rift Valley, give rise to other anomalies.

Of the four great rivers two, the Nile and the Congo, rise in the East African Highland, while a third, the Zambezi, originates on its south-western margin. The Nile is the only African river of any importance which finds an exit to the Mediterranean, and the only one which succeeds in traversing the Sahara in a longitudinal direction. To the west of its Saharan course that great tract not only sends no water to the sea, but for the most part is devoid of permanent streams, water running in the wadis or stream-beds only for a few hours after the infrequent rains. The shrinking Lake Chad, south of the desert proper, has no outlet. The Niger, the third in size of the African rivers, after the Nile and the

Congo, rises in the Guinea Highlands and has a peculiarly indirect course, and a remarkable lop-sided arrangement of tributaries, these being absent on the desert side where it takes its great bend to the north. Like the Senegal and the Gambia it had probably once a wider catchment-basin, as the Sahara appears to be growing drier.

No streams of any importance enter the Red Sea, and so far south as the Zambezi, which enters the Indian Ocean in latitude 18° south, this may be said to be largely true of the whole eastern coast. This condition is due to the fact that part of the Rift Valley has no outlet to the sea at all, while the Nile draws off the water of the plateau between the two arms of the Rift, and the Congo that of the western edge of the East African Highland. Lake Nyasa is drained to the Zambezi by the Shire. The Congo, fed by the abundant equatorial rains, has a great development of tributaries, and drains all the interior of the equatorial area. The Zambezi is like a smaller Congo, draining to the east instead of to the west, and to the south of its upper section a region of internal drainage, with Lake Ngami at its heart, recalls the Lake Chad area to the north. Still further south the Orange traverses nearly the whole breadth of the continent to enter the South Atlantic Ocean.

An interesting point as regards the Nile and the Congo, the two greatest rivers of Africa, is that, whereas the former is much the longer, approaching 4,000 miles as against 2,900 miles, it drains a considerably smaller area, only about four-fifths of that drained by the Congo. Similarly while the Niger is only some 200 miles shorter than the Congo, it drains an area only about half the size. The Nile and to a less extent the Niger are during the desert parts of their courses "alien" rivers, carrying no water to the sea from the lands they traverse.

CLIMATE. Climatic conditions in Africa are of very great interest. Since, as we have seen, it extends practically the same distance north and south of the equator, we

should expect that the climatic regions would be repeated on either side of that line. Since, further, there is considerable uniformity in the relief, with a complete absence of transverse mountain chains to serve as climatic divides, we should expect climatic types to be developed with an almost diagrammatic simplicity. To a certain extent both expectations are fulfilled, and the presence of the typical Mediterranean climate in the extreme north-west, in the Atlas Lands, and in the extreme south-west, in the Cape of Good Hope area, is a point of extraordinary interest.

At the same time we have to note certain special features which introduce complexities into the general scheme. Not only is the northern part of Africa far broader than the southern, but it is greatly influenced climatically by the fact that it is to all intents and purposes a part of Asia. Further, the East African Highland, with its northward continuation into the Abyssinian high plateau, and its southward continuation into the plateau of South Africa, brings about great modifications. These affect not only temperatures, which diminish with elevation above sea-level, but also rainfall conditions, particularly in the region of the south-easterly trade-winds. The high plateau edge of the Drakenberg, for example, forms an obstacle to the penetration of rain-bearing winds which affects greatly the rainfall of the lands behind. The conditions here show a marked resemblance to those in corresponding latitudes in eastern Australia.

It is most convenient to begin with the equatorial type of climate. The general characteristics of this type are as follows :—

1. The temperature range throughout the year is small, the daily range being greater than the seasonal.
2. Rainfall tends to be high and occurs at all seasons, with a tendency towards a double maximum, at or near the periods when the sun is most nearly vertical at noon.

3. Rainfall is thunderstorm rain, coming in very heavy showers in the hottest period of the day.

It is usual to speak of the Congo basin and the Amazon basin as the two most extensive areas of typical equatorial climate on the earth's surface, but it should be noted that they are not strictly speaking comparable. In equatorial Africa only a narrow coastal strip lies below 600 feet above sea-level, and the height of much of the plateau modifies both temperature and rainfall conditions. Further, the

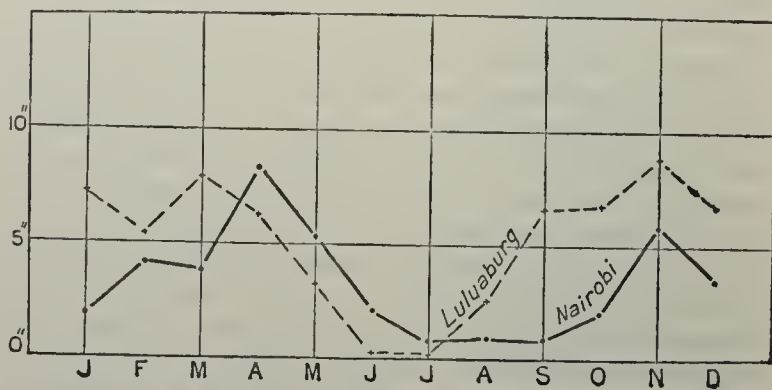


FIG. 28.—MEAN MONTHLY RAINFALL AT LULUABURG AND NAIROBI.

Amazon basin faces east and is freely open to the trades as they move with the apparent movement of the sun, while the Congo basin faces west, and is sheltered from the trades by the East African Highland and the Rift Valley. Total rainfalls thus tend to be lower in equatorial Africa than in equatorial South America.

One other point has to be noticed. The equatorial rainfall régime, with no dry period, is limited to stations on or quite close to the equator. Since equatorial rains "follow the sun," that is, attain maximum intensity about the time when the sun is vertically overhead at noon, a distance of even a few degrees from the equator tends to produce a period of partial or complete drought, as there are one or two months in the year when the noontide sun

deviates notably from the vertical position. Thus a place a few degrees north of the equator will tend to have a dry period in December and January, because the sun is vertically above the Tropic of Capricorn at noon at the winter solstice of the northern hemisphere. Similarly a place a few degrees south of the equator will tend to have a

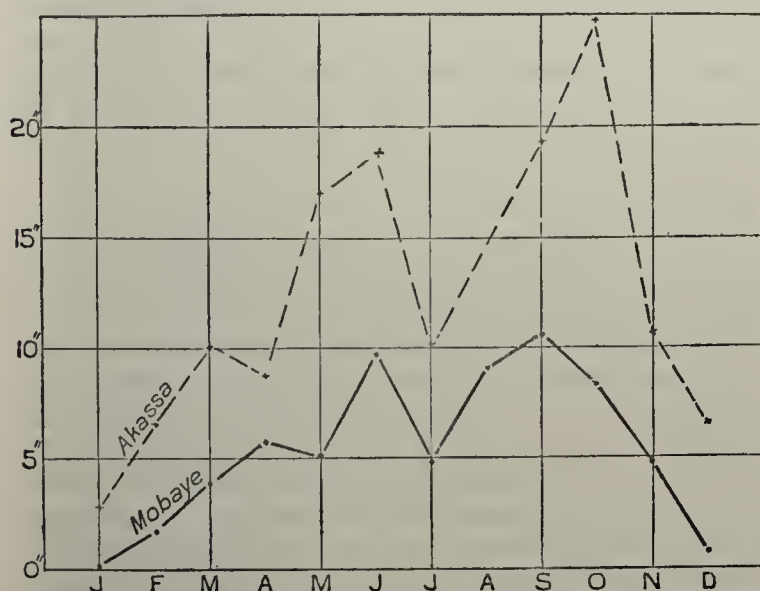


FIG. 29.—MEAN MONTHLY RAINFALL AT MOBAYE AND AKASSA.

dry season in June and July, since the apparent movement of the sun brings it northwards to the Tropic of Cancer at the summer solstice of the northern hemisphere.

The rainfall curves (Figs. 28 and 29) should be examined with these facts in mind. Fig. 28 shows the rainfall régime of Luluaburg and Nairobi, the two curves being closely parallel to one another, though the former has a much heavier total fall. Both stations lie south of the equator and the curves should be compared with that for Mobaye in Fig. 29, a station north of the equator.

Luluaburg is in latitude 6° south, on the Lulua tributary

of the Congo, at a height of 2,034 feet on the plateau. It shows the characteristic small temperature range, though the actual temperatures are modified by the elevation above sea-level. Thus the mean temperature for February, the coolest month, is $75^{\circ}7$ F., that for December, the warmest month, $77^{\circ}2$. The total rainfall is 61 inches per annum, and there is a dry period in June and July. Mobaye, on the Ubangui tributary of the Congo, in latitude 5° north, at a height of 1,312 feet, has a closely similar total rainfall, the main difference being that the dry period comes in the northern winter (December and January).

With these two stations should be compared Nairobi, placed at an elevation of 5,450 feet on the East African Highland, about latitude $1\frac{1}{2}^{\circ}$ south. The mean temperatures here are much reduced by the elevation, so that the hottest month, March, has a mean temperature of only 65° . But since the coolest month (July) has a temperature of 59° , the equatorial feature of a low range is maintained. Nairobi has a mean annual rainfall of only 39 inches, but the moderate temperatures make this adequate for cultivation. There is no absolutely dry season, but the heavy rains of April and November are separated by a period of low rainfall in the period July to September.

With these stations should be compared Akassa (Fig. 29) on the Niger delta. It is in latitude 5° north, practically that of Mobaye, but differs in the low elevation, about 20 feet only above sea-level. The effect of the low-lying position is shown in the temperatures, the monthly means ranging from 76° to 80° , but the most striking feature is the very heavy rainfall, which reaches 144 inches. There is no true dry period, but the "winter" months are relatively dry, and the curve shows the characteristically equatorial two-peaked condition, with maxima in June and October. The heavy rainfall here is due to monsoonal influences, the prevailing winds in the rainy months being south-westerly, i.e. from the sea, while in the drier period

north-easterly winds, which are dry, blow out from the Sahara. The north-easterly wind or harmattan is often called "the docteur," because of the welcome dryness of the air during its prevalence.

Fig. 30 illustrates tropical as distinct from equatorial conditions. As we pass north or south away from the equator the interval between the two passages of the overhead sun diminishes and the two-peaked curve of the equatorial areas becomes the one-peaked curve of the

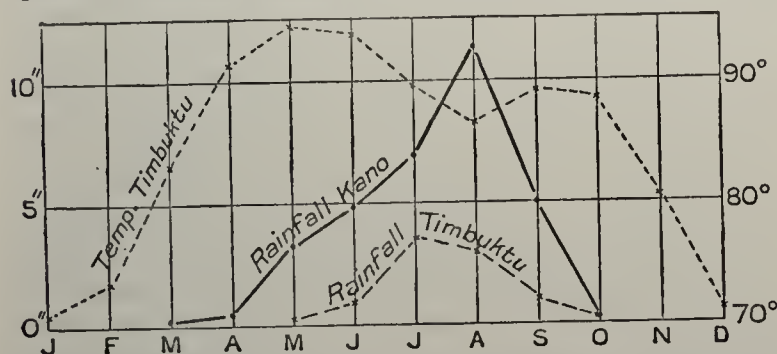


FIG. 30.—MEAN MONTHLY RAINFALL AT TIMBUKTU AND KANO, AND TEMPERATURE AT TIMBUKTU.

tropics. At the same time the total rainfall diminishes, the dry season becomes greatly accentuated, the temperature range increases, and the clear, dry air causes the early summer temperatures to reach heights unknown in the moist equatorial belt.

The two stations selected as illustrations are Kano, in the Nigerian Highlands, at an elevation of 1,570 feet, in latitude 12° north, and Timbuktu, on the northward bend of the Niger, in latitude $16\frac{1}{2}^{\circ}$ north, at a height of 820 feet. The total rainfall at Kano is 32 inches, and the period October to April is practically rainless, August being the rainiest month. At Timbuktu, already on the desert margin, the total fall is only 9 inches, the dry season is very long, and July, not August, is the month with most rain. Timbuktu has a temperature range of 23° , the mean

temperature of May, the hottest month, being well over 94° (contrast Nairobi).

This tropical climatic type occurs south of the equator also, in similar latitudes, but has a very wide distribution in the northern area, because of the width of Africa there. To the extreme east, however, in the Abyssinian plateau, conditions are somewhat different. The size and height of the plateau increase the rainfall, and there is also a development of monsoonal conditions, with an indraft of moist sea-winds. Thus at Addis Ababa, in latitude 9° north, at a height of 8,000 feet, the total mean rainfall rises to nearly 50 inches, without losing the characteristic feature of the summer maximum, August and July being the rainiest months, while December is rainless. It is these rains which are the important element in causing the Nile floods, and the concentration of the fall within a few months is particularly important as causing the sudden rise of the rivers, while the equatorial tributaries of the Nile rise in a region of fairly evenly distributed, i.e. equatorial, rainfall.

Timbuktu exemplifies, as we have seen, the transition between the tropical, or summer rain area, and the desert. To the north the desert type prevails right across Africa, from the Atlantic coast to the Red Sea, where minor modifications occur, and is continued northwards to the Mediterranean shore, save where Mediterranean conditions, with winter rains, appear in the Atlas Lands. Throughout this vast area summer temperatures are very high, and the annual range is considerable. The diurnal range, on the other hand, is enormous, radiation taking place with great rapidity at night, temperatures below freezing being not uncommon then. The mean annual rainfall at the lower levels is always below 5 inches and may be practically nil. But the central plateau areas often receive heavy thunder showers, which flood the wadis. Such rain as falls tends to be summer, i.e. tropical, rain towards the south and cool season, i.e. Mediterranean, rain towards the north. The

extreme dryness, and the vast extent of the dry area, is due to the prevailing north-easterly trade winds, which blow overland, and from cooler to warmer regions.

The corresponding desert area south of the equator is much smaller, and limited to the western side, since the south-easterly trade winds blow over the ocean and bring a considerable amount of rain to the eastern area, even though the Drakenbergs prevent these from carrying much moisture to the interior. In South Africa as a whole, except in the south-west of the Cape Province, the rains tend to occur in summer, the winters being dry. The total fall is moderate or deficient in the interior, but the great obstacle to agricultural developments rises from its unreliability, there being great variation from year to year.

NATURAL VEGETATION AND LAND UTILISATION. This account of the main climatic types gives us the key to the distribution of natural vegetation in Africa, which is shown, in somewhat generalised form, on Fig. 31. We have to note that dense equatorial forest is virtually limited to parts of the Congo basin, with a western extension along the Guinea coast, where it occurs in a narrow strip in the area of high rainfall. An enormous tract is covered by parkland savanna, the home of most of the great African wild hoofed animals, or Ungulates. This vegetation type corresponds to the regions which have heavy summer rains, permitting of the growth of tall grasses; but also a dry season of greater or less extent, so that the land can carry, as a rule, only trees tolerant of seasonal drought, occurring mostly in clumps or in open woods, or along the courses of streams, the so-called gallery-forests. This savanna country passes to the north and to the south into the still drier steppe areas, where trees, except those like the acacias, which are very resistant to drought, are limited to areas near water-courses. But the heavier rains of the east coast south of the equator account for the appearance there of denser woods, replacing the

savannas and steppes of the interior. These woods include mainly trees which shed their leaves in the dry season, a marked contrast to the evergreen forms of the equatorial forest. Nor do they show the tier formation of the equatorial forest, nor the enormous development of woody creepers (lianes) which makes that forest so impenetrable. Tier formation is the term used to describe the peculiar stratification of the rain forest, the trees of which can be grouped on a height basis into successive layers or strata. Thus certain kinds attain a height of 100 ft. and their canopy forms the topmost layer. Two or three lower layers tend to occur, each tier having its characteristic species, with a fixed limit of height. The shade cast on the ground is thus very dense (Plate XI).

The steppes pass into steppe-desert and desert as the total rainfall diminishes, the great feature here being that there is not a complete vegetation cover at any season of the year, the plants, often mat-like or cushion-like low shrubs, with clumps of grasses, standing well apart from each other. The two areas of Mediterranean vegetation on the margins of the steppe-desert are shown on the map by the same type of shading, but it should be noted that though the characteristic shrubs and trees in both cases are evergreen, with small leaves and various means of protection against summer drought, yet the actual plants present in the two areas are strikingly different, the Cape having a very peculiar flora of its own.

In a broad and general sense the vegetation map affords a guide to the use which can be made of the land. The steppe-deserts as a whole are unfitted for agriculture, except in the oases and particularly in that part of the Nile valley which can be irrigated by its floods. The steppe-deserts are the natural homes of pastoral peoples, but it should be noted that both the latitude and the general uniformity of the relief prevent pastoral nomadism in Africa from attaining the importance it does in Central Asia. Nowhere are there even seasonally those vast

tracts of good pasture which fed the flocks of the wandering Asiatic peoples.

The moister steppes and the savannas are suitable for

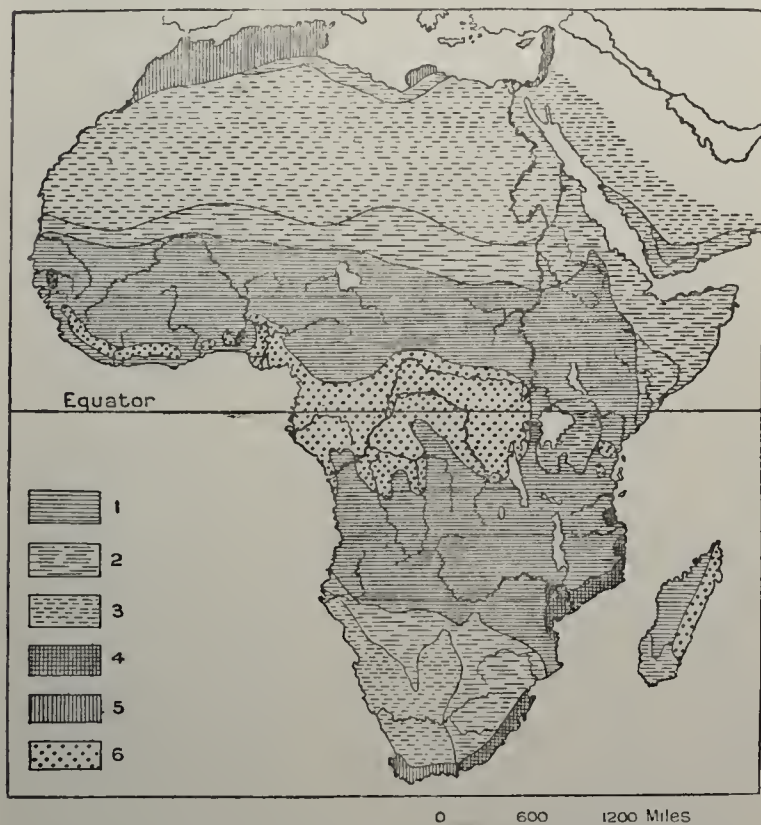


FIG. 31.—DISTRIBUTION OF VEGETATION BELTS IN AFRICA.

1. Savannas and parklands; 2. Steppes; 3. Desert; 4. Deciduous forest; 5. Mediterranean scrub-forest; 6. Evergreen rain-forest.
From *Hettner* (modified).

a combination of pastoral farming and agriculture, and such mixed farming is carried on largely by the Hamites and Semites and by negroes, and now by Europeans in South Africa and to a minor extent in the East African Highland with negro labour. The forested areas, when

cleared, are climatically suitable for cultivation, but neither in their natural state nor when cleared in patches are they fitted for stock-rearing. The latter fact is due to the prevalence of insect-borne disease. The tsetse-flies, in particular, live in wooded and bush country and are blood-suckers. Many of the wild mammals of Africa, particularly the large antelopes, contain in their blood minute parasites which do not seem to do them much harm. But if these parasites are introduced into the blood of domesticated cattle and horses they cause diseases which are rapidly fatal, and the tsetse-flies act as carriers, taking the parasites from the blood of the wild animals and introducing them into that of the domesticated forms when they bite.

Negro agriculture as practised in forested areas has thus to be carried on without the aid of stock animals. Its characteristic implement is the hoe, manuring and rotation of crops are not practised, and the method adopted is to burn down a patch of forest, and plant rapidly-growing crops in the wood-ash. The plots soon lose their fertility and after a short period are abandoned and a fresh patch cleared. The crops grown also are mainly of comparatively small nutritive value, usually starchy and sugary foods like yams, bananas and the less valuable cereals such as maize and millets. Agriculturally, indeed Africa, with the notable exception of the Nile valley, is of comparatively little importance. The areas in which Europeans can live and work with comfort are mostly too dry for successful agriculture, and the difficulties which face cultivation in the moister areas have not yet been overcome. It may be noted that even the establishment of plantations worked by negroes under European supervision is not easy, one obstacle being that it is difficult to feed the workers properly in a continent which produces inadequate amounts of the more nutritive foodstuffs, and where, moreover, transport of food from place to place is slow and very costly. Hitherto the

damper parts of Africa have tended to furnish to world commerce naturally-produced commodities, such as rubber, palm oil and ivory, rather than those resulting from human labour.

PEOPLE. There are some interesting points in regard to the distribution of racial stocks in Africa. The whole of the northern and north-eastern part is occupied mainly by two great stocks, the Hamites and Semites. The former, which include many of the Egyptian peasants, the Berbers of the Atlas Lands, the Tuaregs of the Sahara and other groups, belong to the Mediterranean group of the white race, and seem to have been the first inhabitants of the northern belt. The Semites include mainly the Abyssinians and the Arabs, the latter comparatively recent immigrants who have spread widely, and have influenced an even larger area, particularly by the spread of Mohammedanism. All these peoples stand at a relatively high stage of culture, using the plough where they are cultivators, having a knowledge of irrigation and considerable skill in the management of stock animals.

The remainder of Africa is occupied mainly by negro stocks, showing a considerable admixture of other blood towards the north along the line of junction with the Hamites and Semites. It is usual to distinguish between the Sudanese negroes and the more typically negro Bantus of the centre and south. In the south-east occur the small Bushmen, who remain at the hunting and collecting stage of culture, and the pastoral Hottentots, the latter believed to be a race of mixed origin. Both peoples occur now only in small numbers. Apart from the Atlas Lands European settlement has taken place mainly in the south, though without displacing the Bantu negroes, and to a smaller extent in the East African Highland.

At first sight it seems very remarkable that the more specialised peoples, with their better agricultural methods, should be limited to the arid and semi-arid north, leaving the moister lands of the centre, apparently more pro-

ductive, to the less skilled negro. But it seems fairly clear that the southward extension of Hamites and Semites alike has been checked by the difficulty of keeping stock animals in the damper and therefore wooded and fly-infested areas. The plough without animals to pull it is of no value, and life without large stock animals is almost inconceivable for the northern peoples. In this connection it is very interesting to note that in East Africa, in the higher, drier, fly-free areas of the Highland, the northern peoples extend, in Abyssinia and Somaliland, within a few degrees of the equator, and the Sudanese type of negro, of supposedly mixed blood, also extends much further south here than in the west. In the west, indeed, the Guinea coast forests and those of the Congo basin form a complete block to the southward extension of cattle, while the East African Highland seems to have formed a bridge by which domesticated cattle could be carried to South Africa, where conditions are again suitable for them.

MEANS OF TRANSPORT. Apart from the limited development of agriculture, one of the great causes of the backwardness of Africa lies in the difficulties of transport and communication. Not only is access rarely easy from the coast, but even after the plateau rim has been surmounted the real problems have still to be faced. It is indeed easy to exaggerate the importance of the rapids or other interruptions to navigation which often occur near the mouths of the rivers. It is true that the Congo is only navigable from the ocean to Matadi, 96 miles up, and is then unutilisable for 226 miles in the area where it breaks through the rim of the plateau, and that the Orange river can be used only for a few miles from its mouth. But such marginal obstacles where they occur are not the only ones. Niger, Congo above Stanley Pool, Zambezi and others, all illustrate the fact that even on the plateau surface navigable stretches alternate with long unnavigable sections, and even the Nile, the most important water-

way of Africa, has rapids and other obstacles on its course. Further, the negro peoples use the inland waterways comparatively little, and do not attempt to face the difficulties of ocean navigation. European explorers found nothing in negro Africa to correspond to the skilful Indian use of waterways which made the exploration of a large part of North America relatively so easy.

Even more important is the general absence of transport animals. Here again the arid lands of the north possess unsuspected advantages. The camel does not appear to be native, and was probably a late introduction, but it is peculiarly fitted for desert transport. The horse, ass and mule can be used in parts of the northern area, the ass being especially interesting because it was probably first domesticated in the lower Nile valley from an Abyssinian wild form. It is much hardier than the horse, and is used especially in the French part of the Sudan.

But throughout an enormous area in Central Africa fly-borne disease prohibits the use of all transport animals, and human porters have been and remain still to a large extent the only means of carrying goods. This is a very striking contrast to South America. It is one of the most curious facts of geography that while that continent has no native horse, nor ass, nor ox, nor camel, the Spaniards were able to introduce there all the transport and stock animals to which they were accustomed in Europe, and all thrive amazingly. Further, the native inhabitants had already domesticated as a transport animal the indigenous llama. But Africa, which is enormously rich in Ungulates, including horse types, buffaloes, elephants, antelopes and many others, not only does not contain, south of the Sahara, any native domesticated transport animals of its own, those present having been introduced, but over very large areas it cannot even carry introduced forms. Even in South Africa, where fly disease does not occur, horses are difficult to rear because of another disease. Here the

Dutch introduced ox-drawn carts, still largely used away from the railway. But the dependence on the slow and costly human porter has been the greatest obstacle to the development of tropical Africa; man is made for better things than to be a beast of burden.

Except in South Africa railway development has only taken place on a limited scale. The greatest hope seems to lie in mechanical means of transport, requiring little in the way of a prepared track, such as motor bicycles and the newer types of motor cars.

The contrasts just noted, in climate, peoples, modes of land utilisation, methods of transport and so on, give us a very rough division of Africa into three parts:—the wide northern area made up of the desert and its margins, the central area of equatorial and sub-equatorial climate, and the southern plateau. These we shall consider separately.

See Alex. Knox, The Climate of the Continent of Africa (Cambridge, 1911), with a useful glossary of vegetable products; Shantz and Marbut, The Vegetation and Soils of Africa (New York, 1923), L. S. Suggate, Africa (London, 1929); C. Lucas, The Partition and Colonization of Africa (Oxford, 1922).

CHAPTER XIV

EGYPT AND THE SUDAN: THE DESERT AND ITS MARGINS

THE SUDAN

ONE of the difficulties in obtaining a clear picture of the arid and semi-arid lands of the northern part of Africa is that the political units show little relation to natural regions, and words with a definite meaning in human geography are often used politically in quite a different sense. Thus the word Sudan, which means Land of the Blacks, is applicable, strictly speaking, to the belt of steppe and savanna land south of the desert, where rainfall is generally sufficient for some cultivation, and stock-rearing can be carried on on a fairly extensive scale. But it is sometimes used loosely for the Anglo-Egyptian Sudan, and this involves a double error. Part of that great territory belongs to the true desert (Nubia) and not to the Sudan at all. Much of its southern section is savanna land, but, far from being limited to this area, similar land, forming the Sudan in the strict sense, is continued right across the continent. In the west and centre it falls mainly within French territory, but includes also Northern Nigeria and the northern part of the Gold Coast Colony.

This conception of the Sudan as a continuous belt of territory stretching practically from sea to sea in an east to west direction is an important one for the understanding of African problems. While the west and most of the centre is mainly French, and the east and eastern part of the centre is mainly under British control, the Red Sea coast

of the Anglo-Egyptian Sudan is limited by the strip of Italian territory in Eritrea, with the smaller territory of French Somaliland to the south. The independent state of Abyssinia stands like a bastion between the Anglo-Egyptian Sudan and the Horn of Africa, divided into British and Italian Somaliland. As already indicated it is the presence of this lofty bastion which gives rise to the Nile floods, and thus to the ribbon of cultivation through the heart of the desert which we call Egypt. The Abyssinian rivers further give a possibility of irrigation to the Anglo-Egyptian Sudan to which there is little to correspond in the French Sudan, though it is hoped to make use of the Upper Niger and the tributaries which flow from the Guinea Highlands.

As a whole this vast area is not unproductive, and in parts it has great possibilities ; but the great difficulty is that of access. At first sight the Anglo-Egyptian Sudan seems to have a great advantage over the western, mainly French, section in that it is traversed by the Nile. But this advantage is not as great as might appear. In the first place the Nile between Aswan and Khartoum is interrupted by the six "cataraacts" or areas of difficult navigation. Aswan marked the upper limit of the historic Egypt as it still marks the limit of extensive cultivation and settlement. Between Aswan and Berber, indeed, extends the land of Nubia, functionally a desert stretch between Egypt and the Sudan. Within this stretch there are no less than five "cataraacts" or sets of rapids on the Nile, greatly obstructing navigation. Further, the river takes a great bend to the west, so that it affords a very indirect route to the south. Modern lines of communication also do comparatively little to bridge over this natural break between the civilised land of Egypt to the north and the Land of the Blacks to the south.

In particular it should be noted that the Nile valley railway coming from the north stops at Aswan (Fig. 32). Between that town and Wadi Halfa, the frontier

town of the Anglo-Egyptian Sudan, communication is maintained by river steamers only. At Wadi Halfa the railway begins again, cutting off the westward bend of the Nile by running direct to Abu Hamed, whence it follows the river past Berber to Khartoum. But from Berber a line runs to the Red Sea coast to the ports of Port Sudan and Suakin, and this line is connected by a branch to the cotton-growing area of Kassala. From Khartoum also a line runs to Sennar, near which is the great Makwar dam on the Blue Nile, permitting of the irrigation of the Gezira, or land between the Blue and White Niles, again fitted for cotton production.

From Sennar a line runs westwards to El Obeid, in Kordofan, and north-eastwards to Kassala (Fig. 33). The connection between El Obeid and Kassala and the Berber-Red Sea line indicates the general tendency for lines of communication to be diverted towards the Red Sea, rather than to follow the apparently natural, but indirect and interrupted, route by the Nile.

It may be noted further that while schemes have been proposed for railways to connect Khartoum via Sennar and via El Obeid to Uganda, communication is maintained meantime only by river steamer. Steamers ply between



FIG. 32.
LOWER NILE VALLEY.

Khartoum and Rejaf, in the extreme south of the Anglo-Egyptian Sudan (Fig. 33). There is then a gap of about 150 miles in river navigation, and a motor road connects with Nimule, in Uganda. From that point steamers run to Lake Albert. Incomplete though these southern connections still are, they are interesting as suggesting that in the future part of the Anglo-Egyptian Sudan may find an outlet to the south.

It is anticipated that great developments will take place in the region in the future. As natural products it yields large amounts of gum arabic from Kordofan and Darfur, and of ivory from the wooded regions further south. In addition to the irrigated cotton-fields of the Gezira, rainfall cotton can be grown in the damper areas, as at Kassala and in the south, with a number of minor crops.

As contrasted with this eastern area the part of the central and western Sudan which is in French hands seems, as already said, to labour from the great disadvantage that it has no equivalent of the Nile. In earlier days caravan routes existed, especially from the confines of Morocco to Timbuktu on the Niger, but despite French efforts to develop lines of communication across the Sahara—efforts made mainly to put down the turbulent Tuaregs of the centre—modern trade lines tend to take other directions.

One great advantage of this western area is that the Guinea coast gives a possible southern outlet to the sea, which is fairly direct. That part which lies in Northern Nigeria is linked to the ports of Lagos and Port Harcourt, respectively west and east of the Niger delta. The French also, in Dahomey, the mandated area of Togo, and the Ivory coast, are endeavouring to push railways towards the interior. Much more important, however, is the possibility of an outlet by the Atlantic coast, and the ports of Dakar, in French Senegal, and of Konakri, in French Guinea, should be noted. Dakar is connected by railway to the navigable section of the Upper Niger, and this region produces large amounts of oil-seeds (ground nuts,

sesame, palm kernels, etc.) for the soap industries of Marseille (p. 30), while cattle and sheep are extensively reared.

The central part of the French Sudan is much more difficult to tap, but it should be noted that just as the Anglo-Egyptian Sudan is contiguous with the British protectorate of Uganda in the east, so in the west the central part of the French Sudan is widely continuous with French equatorial Africa and the mandated Cameroon area. Thus to the east, to the west and in the centre, the general tendency is under modern conditions to maintain the old separation between the Sudan and the Mediterranean, and to seek outlets to the Red Sea and the North Atlantic, or through equatorial territories.

EGYPT

Egypt is essentially that part of the Nile valley and of the delta where cultivation can be carried on by aid of irrigation. There is no temperature check to plant growth throughout the year, so that crop production may be virtually continuous if water is available. But there is practically no rain (Alexandra, 8 inches per annum, Cairo 1 inch), and all water is river water, often brought to the crops by an enormous expenditure of human labour, which has only

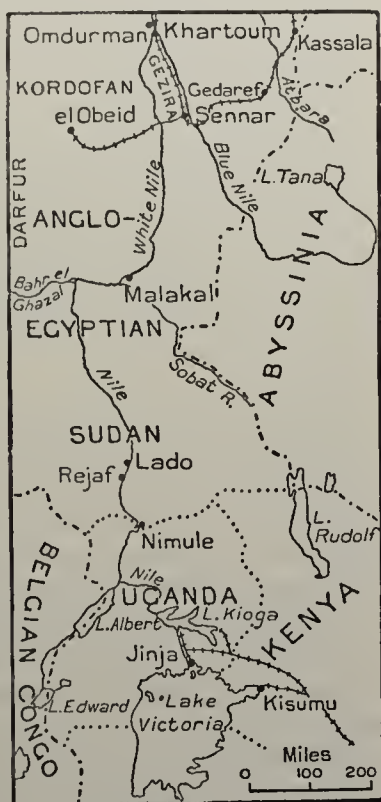


FIG. 33.
UPPER NILE VALLEY.

been diminished, in recent years and to a limited extent, by more efficient irrigation and mechanical means of lifting water.

On a political map Egypt forms a rectangular block of territory, extending eastward into the Sinai peninsula. The area of this block of land is 383,000 square miles ; but the fact has no significance. The essential point is that of this total only about 13,600 square miles is settled and cultivated, the remainder is desert and waste. The density of population in the settled area is over 1,000 per square mile, and since the inhabitants depend upon agriculture for their livelihood the figure speaks to the great productivity of Egyptian cultivation (cf. Java, p. 204). There are now over 14 million inhabitants, increase having been rapid with improved methods of irrigation.

To grasp the distribution of the cultivated area and the nature of the crops we have to examine the Nile and note in a little more detail the causes of the periodical flooding.

THE NILE AND ITS FLOODS. The Nile headstream is regarded as the Kagera, which flows into Lake Victoria. On emerging from that lake it flows as far as Rejaf (p. 244) over the plateau in a region where lakes and rapids alternate. Thus it enters Lake Albert over the Murchison Falls, but emerges almost at once as a navigable river. Its waters in this first or plateau section are derived from the equatorial rains, through the instrumentality of the great lakes, and show comparatively little variation throughout the year.

It then enters a vast alluvial plain through which it meanders. The southern part of this plain is clothed with forests and thickets, giving place further north to grass-covered areas, and the flow is sluggish, the river spreading out into lakes and swamps. In the swamps papyrus and other reeds and marsh plants grow luxuriantly, and large masses of these are often torn off by winds and currents and float about in the stream. Such masses form the sudd,

which is so great an obstacle to navigation in this section of the Nile. A navigable channel is only kept free from sudd with great difficulty. Though in this second section the river receives the Bahr-el-Ghazal from the west and the Sobat from Abyssinia, so much water is lost by evaporation in the swamps that it diminishes instead of increasing in volume. But the flow is fairly constant throughout the year.

The alluvial plain continues practically to Khartoum, where the third section begins. In this the river flows in a valley which is usually narrow, over a denuded area consisting of old, hard rocks. Specially hard belts of these rocks form the six cataracts between Khartoum and Aswan, the sixth occurring downstream from Khartoum and the first above Aswan, where the river breaks through a belt of granite.

Below Aswan the river begins to flow in a narrow, canyon-like gorge, eroded in sandstones, which stand up as cliffs on either side: Below Esna the sandstones are replaced by limestones, but the gorge character continues. The bounding walls are from two to fifteen miles apart, and at periods of low Nile the river is bordered by strips of dark earth, contrasting sharply with the yellow desert sand. This deposit has been brought down by the floods, and is especially rich in potash derived from the volcanic rocks of Abyssinia.

Finally, at Cairo the delta section of the river begins, the Nile entering the Mediterranean by several mouths.

At Khartoum the Blue Nile, flowing from Lake Tana in Abyssinia, joins the main stream, and at Berber the Atbara. Both rivers are heavily flooded by the rains of Abyssinia during the summer months, and it is their silt-laden water which has given rise to the alluvial soil of Egypt. Below Berber, on its course of some 1,700 miles to the sea, the Nile receives no further tributaries.

As the Abyssinian tributaries swell, the Nile begins to rise; this occurs in June. The flooding reaches its maxi-

num at the beginning of October, and thereafter the river subsides. The Blue Nile usually continues to flow through the year, though it carries little water after January. The Atbara generally fails to flow after that month. But the White Nile, or main stream before the junction, has its waters partially dammed back by the summer flood water of the Blue Nile, and thus, despite the very small amount of water coming from Abyssinia, the Nile continues to flow through Egypt throughout the winter months, if in greatly diminished volume.

IRRIGATION AND CROPS. Two methods of irrigation, that is control of the flood waters, are practised in Egypt. The older, the basin method, is still largely practised in Egypt above the delta, but since the first half of the 19th century perennial irrigation has been practised in the delta, and is being extended in the upper area.

By the basin method the flood waters are led off into areas enclosed by earth banks, and allowed to stand for a period of nine to ten weeks, until the silt has been deposited and the soil thoroughly moistened. On the wet land in October or November winter crops of barley, wheat, peas, beans, lentils, clover (bersim), etc., are sown, the cereals ripening in the following April or May. The land is then left fallow, becoming dry and cracked, till water can again be led to it. Thus the summer heat is largely wasted, except in so far as water can be lifted to the lands above water-level. In parts of Upper Egypt, where extensive sugar-cane plantations have been established with foreign capital, powerful pumps are often installed to raise the water to the fields. But the peasants mostly employ simple and laborious methods and can therefore only produce summer crops on a very small scale. What are called autumn crops are those, such as maize and millets, with a short season of growth, which can be sown on the higher lands which are first drained, and ripen before the late autumn drop in temperature sets in.

PLATE X



ASYUT DAM, UPSTREAM SIDE,
SHOWING PASSAGE OF SAILING BOATS



THE BLUE NILE AT KHARTOUM

Photos by H. M. Cadell.

In perennial irrigation the river is dammed back at convenient points to hold up the flood waters, and these are led by high-banked canals to the cultivated areas according to the needs of the crops, without the complete submergence of large areas necessitated by the basin method. This enables the summer heat to be taken full advantage of, and by far the most important crop grown by this method is cotton, extensively produced in the delta. Egyptian cotton is of long staple and is valuable; a very large proportion of the crop is sent to Great Britain. Other crops which require both summer heat and constant watering are rice and sugar-cane, while the date-palm must also be regularly watered.

The most important dams are those at Aswan, Asyut and below Cairo. In addition to the Nile valley proper the depressed area called the Faiyum, to the west, is also irrigated, a canal being taken off near Asyut (Plate X).

Though the advantages of perennial irrigation appear to be very great, certain difficulties arise in practice. The peasants tend to over-water their lands; the want of the fertilising silt also, which is held up by the dam, is a great drawback. It has also been shown that the fallowing period of the basin method, when the soil becomes deeply cracked, and as it were naturally ploughed, is of great importance in preserving fertility, and this resting period is lost under perennial irrigation.

The presence of pulses of various kinds and of the native clover is of great importance in Egyptian agriculture, as these plants enrich the soils. The clover is used for feeding the stock animals, the asses, greatly used for transport, and the water buffaloes, used for ploughing in the delta, but replaced by cattle further up. Other stock animals, such as sheep and camels, are mainly reared by the desert nomads.

Egypt is as yet almost exclusively an agricultural country. The capital, Cairo, nearly on the same site as the ancient Memphis, has now a population of over one

million, while Alexandria, the chief port, has one of half a million. Port Said, at the northern entrance to the Suez Canal, has about 100,000. It should be noted that though the Canal runs through Egyptian territory, Britain holds a very large number of the shares in the undertaking, and the defence of Egypt and of the Canal remains under British control. Lower Egypt, that is the delta area, has a fairly dense network of railways.

THE WEST AFRICAN ISLANDS

A word may be added as to these because the fact that they have good harbours, and, especially Madeira, are fruitful, makes them very convenient calling-stations on the way to the south, and compensates for the small number of suitable ports on the west coast of the African mainland. Funchal on Madeira, with Santa Cruz on Teneriffe and Las Palmas on Grand Canary, in the Canary group, are all coaling-stations, while both island groups serve as winter health resorts for Europeans. The Cape Verde Islands, lying much further south, are hot and arid, but also contain coaling-stations. Aden (p. 218), and to a minor extent Perim, may be regarded as the equivalent coaling-stations on the east coast, though they are not African. South of the Red Sea, however, the east coast of Africa is richer in ports than is the west.

CHAPTER XV

EQUATORIAL AFRICA .

LIMITS AND DIVISIONS. We have seen that the Sudan is a great stretch of tropical savanna land extending from east to west across the widest part of Africa. To the north the equally wide desert stretch separates these tropical lands from the sub-tropical area, which is divided from the standpoint of human geography into the rainless but irrigated land of Egypt to the east, and the Atlas Lands with their somewhat inadequate winter rains to the west. To the south the Sudan passes without either natural or definite political boundary lines into the region where the climate becomes equatorial in type, where dense rain-forest tends to appear at least at the lower levels, and where the shape of the continent brings places in the interior nearer the coast than in the Central Sudan.

To the far south the south-west of the Cape Province repeats the conditions in the Atlas Lands, but though Durban in Natal is in latitude 30° south, as Cairo is in 30° north, the contrast between the human geography of the two places is profound. There is no southern repetition of Egypt. Nor is there anything in the south to correspond to the continuous belt of separation between tropical and subtropical lands formed by the Sahara in the north. Although, therefore, sub-tropical South Africa shows definite points of contrast with tropical and equatorial Africa, yet, especially in the east, it is difficult to find a satisfactory natural division line between the two.

Still other difficulties arise in attempting to set forth a

simple and concise division of Africa south of the Sahara. In all the central region political frontiers are of very recent origin. Not only do they show comparatively little relation to the facts of economic geography, but there has been as yet so little development, and that of so fluctuating a character, that the reciprocal action of man and the natural conditions is difficult to trace. Man is still, as it were, searching after the best solution of African problems ; some of his attempts have already proved to be on wrong lines and fresh starts are being made.

For example, till a few years ago the Belgian Congo was regarded as a typical case of what German geographers call robber economy, that is of the reckless exploitation of natural resources without regard to the future. The resources mainly utilised were rubber from the forests and ivory from the elephants which occupied the forested areas. But the exploitation was so effective that the basis of prosperity was largely destroyed. Congo rubber is now unimportant, having been replaced on the world market by plantation rubber, chiefly from the Asiatic plantations. Present developments in the area are taking place for the most part in the south-east, in Katanga, where the minerals, especially copper, are being worked. This has brought closer economic connection with Southern Rhodesia, which supplies most of the coal from the Wankie field. Thus while a few years ago as a generalisation it might have been said that the Belgian Congo was a typical equatorial dependency, rubber and ivory being equatorial products, now it is necessary to emphasise its economic relation to that part of south-eastern Africa where mineral wealth constitutes the chief basis of prosperity.

Other similar examples might be given, but the essential point is that at the present stage of development any division of Africa south of the Sahara can only be tentative and uncertain. At the same time South Africa, whether thought of as the Union or as the Union plus Southern and

Northern Rhodesia, presents so many contrasts with the central area that it must be regarded as a separate unit. This is true, even though on the west there is no real line of demarcation between Angola and the British mandated territory of south-west Africa, nor on the east between Portuguese East Africa and British territory.

With these facts in mind we may divide the chief territories of Central Africa into three groups. The first includes those which confront the Guinea coast, and of these Nigeria and the Gold Coast are much the most important. Into the second group fall French Equatorial Africa (with Cameroon), the Belgian Congo, and Portuguese Angola, the last marking the transition to the definitely arid area of the south-west; comparatively little development has taken place in any of these areas. The eastern group includes Uganda, Kenya, Tanganyika territory and Nyasaland among British territories, with Italian Somaliland to the north-east and Portuguese East Africa to the south-east. The two Rhodesias mark the transition to South Africa.

Certain general statements may be made in regard to this vast area, again with the caution that generalisation in Africa is particularly dangerous. The climate is almost everywhere quite unsuited to European settlement, the most notable exception being the high plateau in Kenya. But the gravest danger to the health of Europeans has been in the past insect-borne disease, especially malaria. Malaria is caused by minute parasites in the blood, conveyed by mosquitoes, which breed in standing water. It shows a certain analogy to fly disease (p. 236) in domesticated stock animals, though this is transmitted by tsetse-flies and not by mosquitoes. Negroes, especially negro children, seem quite frequently to have in their blood the malarial parasite without showing very marked symptoms of malaria. But if the parasites are carried from them, through the agency of the mosquito, to the blood stream of Europeans, the latter

develop malaria, often with a fatal result. By elaborate and costly methods of mosquito control, by the exercise of extreme care during the night when mosquitoes are active, and by the use of quinine, it is possible to reduce very greatly the incidence of malaria among Europeans. But we cannot assume that even if malaria was got rid of equatorial Africa would become suitable for European settlement. Apart from specific diseases, of which malaria is only one, the uniformly high temperatures and the damp atmosphere seem very unsuited for white peoples.

Again, equatorial Africa has, generally speaking, a sparse native population. Nigeria, with 55 per square mile (cf. Egypt), has one of the highest densities, but this is because parts of the northern or Sudanese area include Hausa peoples, showing for negroes unusual agricultural skill. Kenya, with Indians, Arabs and some Europeans, in addition to the native peoples, has a density of only 12 per square mile. The sparse negro population of Central Africa is partly due to the slave trade of the past, but another factor has been the fearful ravages of sleeping sickness in recent years. Sleeping sickness is a disease similar to fly disease in animals, being disseminated by tsetse-flies. It was probably always present in parts of equatorial Africa, but it has been suggested that its terrible spread was the result of the extensive use of native porters, with a resultant intermingling of infected and previously uninfected groups. Infection is not direct, but the passage of a caravan containing infected porters may lead to the flies of the neighbourhood taking up the parasite, and giving the disease later to the local peoples.

PRODUCTS. It still remains mainly true in equatorial Africa that the commodities which enter into external commerce are natural products, and not the result of human effort, but the commodities have undergone a change. In earlier days gold, brought down by rivers as alluvial gold in e.g. the Gold Coast and by the Upper

Senegal and Upper Niger, ivory and slaves were the chief resources. The Arab traders habitually bought or seized carriers for the transport of ivory, and then sold both carriers and their load at the coast. With modern industrial developments such products as rubber and the products of the oil-palm became important. The latter is a native of West Africa, and extends from about 10° north to 10° south. It produces large bunches of fruits, containing a nut within a fleshy covering. The fleshy part, when boiled, yields an oil used by West African natives instead of butter. Commercially the oil is of value in the making of soap, candles and margarine. The nut contains within its hard shell a kernel which is rich in an even more valuable oil, palm-kernel oil, used for similar purposes. With minor exceptions palm-oil in West Africa is obtained from wild trees, plantations being rare. The fruits are collected and the preliminary processes of preparation carried out by the natives, by very wasteful methods. In addition to the uses named palm-oil is also used to make a thin film over sheet-iron which is to be tinned, for the making of containers for preserved food, mineral oil, etc. Nigeria and the more westerly British Colony of Sierra Leone send large quantities of palm-oil to Liverpool, both for use in the Birkenhead soap works and for the South Wales manufacture of tin-plate. Another interesting Central African product is copal, used for varnishes, which is found in a semi-fossil condition beneath large trees belonging to the pea-flower family, particularly abundant in the forests of the Belgian Congo.

To a minor extent this collection of wild produce is being replaced by the cultivation of crops sufficiently valuable to stand the generally high cost of transport. In Uganda, the Gold Coast Colony, and to some extent in Northern Nigeria, cultivation is carried on by natives for export. In Uganda the main crop is cotton, which is developing with great rapidity. The same statement is true

of cocoa in the Gold Coast. Cocoa (cacao), introduced into West Africa from South America, thrives so well here that in 1925 the Colony produced half the world output. In Northern Nigeria cotton and ground nuts are grown, and railway development is making it possible to carry the produce to the coast for export. The production of cotton is also being promoted in the Belgian Congo, which can already supply ten per cent. of the demands of the motherland. Coffee is produced in the native republic of Liberia.

Elsewhere crop production is mainly carried on in plantations by native labour under European management. Thus Nyasaland produces tobacco, Kenya and Tanganyika sisal hemp and coffee. Sisal hemp is a fibre derived from an American species of agave, used chiefly for the making of twine. Cocoa, apart from the native production in the Gold Coast, is grown on plantations in the Portuguese island of St. Thomas, nearly on the equator. Cloves are produced in the islands of Pemba and Zanzibar, off the coast of British East Africa.

Mineral deposits are fairly widespread in equatorial Africa, though no very great developments have taken place. The tin fields of Nigeria (near Bauchi), the coal of the same area at Udi in the south, with railway connection to Port Harcourt on the Bonny river, the manganese and bauxite (aluminium ore) of the Gold Coast may be mentioned, in addition to the copper of Katanga (p. 252).

COMMUNICATIONS. The great obstacle, apart from the general deficiency of labour, to such developments, whether in the direction of cultivation or the working of mineral deposits, lies in the difficulty of transport. Ports are not lacking; it is the effective connection of these with the interior which is the problem.

On the Guinea coast the general tendency has been to run out railways from the ports towards the interior. Thus in the Gold Coast colony both Accra and Sekondi are connected to Kumasi by rail. The new harbour of



EQUATORIAL FOREST ON THE LOMAKO RIVER, A LEFT-BANK TRIBUTARY
OF THE CONGO

The region, which is in the Belgian Congo, contains many elephants ; it is much infested with tsetse-flies, and is very typical of areas on or near the equator.



OIL-PALMS IN THE BELGIAN CONGO

The native village among the palms stands on the summit of a plateau which rises above the surrounding dense forest. To the right centre may be seen an ant hill, on whose top, which overpasses the roof ridges of the adjacent huts, is housed the village drum.

Photos by Rev. James Moon.

Takoradi, six miles from Sekondi, is admirably equipped for dealing with the growing trade of the colony. Nigeria has quite the best developed railway system in this area. At first sight this seems curious in view of the fact that the Niger is navigable from its mouth to well above the confluence of the Benue, and that river is also navigable; thus it might be supposed that the area was fairly well provided with waterways. But the densest population and the most progressive peoples are found in the higher and drier regions of the north, round Kano (p. 231) and Zaria, at some distance from both rivers. Since the railway was extended to this area the Hausa peoples are growing crops for export on a steadily increasing scale.

In the Belgian Congo the river and its tributaries form a fine series of internal waterways, and railways have been mostly built to bridge gaps in river communication. Angola presents an interesting contrast. It contains some good ports, particularly Benguella, with the adjacent harbour of Lobito Bay, with Loanda to the north and Mossamedes to the south, but is without important rivers. Railways are being pushed out from the ports towards the interior with the idea of tapping the trade of the southern part of the Belgian Congo and of Northern Rhodesia. That from Benguella extends furthest into the interior and from its termination the Katanga area can be reached by motor car. Angola is a region of considerable interest, though as yet backward. The cold current which washes the shore not only modifies the temperature conditions, but makes the fisheries rich, Norwegian whalers having stations here. Much of the surface is high plateau, and it is believed that it will prove well fitted for European settlement; a considerable number of whites are already present.

By far the most interesting development of lines of communication has, however, taken place in East Africa (Fig. 34). It is now doubtful whether the grandiose

scheme of a continuous railway from the Cape to Cairo will be realised, at least in the near future, but developments in the transverse direction are taking place with



FIG. 34.—LINES OF COMMUNICATION IN EAST AFRICA.

some rapidity. Of very great importance in East Africa is the presence of the Great Lakes, forming admirable highways. The tendency of those which lie in the Rift Valley to be elongated in the north-to-south direction should be noted; it facilitates greatly communication in

this direction. Since no important rivers enter the Indian Ocean till the Zambezi is reached, however, transverse railway lines are necessary to link the traffic of the Great Lakes with the ports. Lake Victoria, which is not a Rift Valley lake, but lies in a relatively shallow depression of the plateau, is connected to the coast at Mombasa by the Kenya-Uganda railway. Lake Tanganyika, again, is linked to Dar es Salaam by rail.

From the important port of Mombasa the first-named railway runs past Nairobi to Kisumu at the north-east end of Lake Victoria. A branch takes off to the north to join the short line which runs from Jinja on Lake Victoria to Namasagali on Lake Kioga, thus bridging the interruption to navigation caused by the Ripon Falls where the Nile leaves Lake Victoria. To the south of that vast lake, which is slightly larger than Lake Superior in North America, the lake port of Mwanza is connected by rail to Tabora on the Central railway from Dar es Salaam to Kigoma on Lake Tanganyika. The last lake again is connected with the Congo system of railways and waterways, so that it is possible, if by a somewhat indirect route, to cross Africa from Dar es Salaam to Boma at the Congo mouth by railway and steamer.

Lake Nyasa, again, is connected by the navigable (for small steamers) waters of the Shire river to the Zambezi, and by railway from Blantyre to Beira in Portuguese East Africa. There is, however, a gap on this route, owing to the fact that there is as yet no bridge across the Zambezi. Beira is also connected to Salisbury in Southern Rhodesia, and so to Bulawayo and the South African system. Bulawayo, again, is linked through Livingstone, passing the Wankie coalfield, to the Congo lines of communication. But even when supplemented by motor-roads and native tracks, these lines of communication are quite inadequate in view of the vast territory to be tapped.

MADAGASCAR

A word or two may be added in regard to the large French island of Madagascar, possibly the remnant of an old belt of land which once connected Africa with the Deccan plateau of India. It is mountainous in the interior, and thus the eastern side, exposed to the trade winds, is wetter than the western, the aridity increasing to the south-west. There are two strands in the thin population, the eastern peoples being of Malay type, and those of the western side negroes. On the wet, forested, eastern side tropical and sub-tropical crops, such as rubber, rice, cotton, coffee, cane sugar, cloves, etc., can be produced, while cattle rearing is the chief occupation in the drier west. Meat-canning is largely carried on. The density of population (under 16 per square mile) is remarkably low.

Five hundred miles to the east lies the British island of Mauritius, very important for its production of cane sugar.

For British territories *see* the various Government handbooks, etc., e.g. *Handbook of British West Africa* (1920), *Handbook of Nigeria* (1926), *Handbook of the Sudan*; Lucas, *Historical Geography of British Colonies*, Vol. III, *West Africa*, revised (Oxford, 1913); Burns, *History of Nigeria* (London, 1929).

CHAPTER XVI

SOUTH AFRICA: THE UNION AND RHODESIA

GENERAL FEATURES. It is convenient to take a line from the mouth of the Cunene to that of the Zambezi as marking the northern limit of South Africa in the geographical as distinct from the political sense. To the south of this line the sub-tropical type of climate may be said to prevail and to the north the tropical. Broadly the line corresponds to the parallel of 18° south, and north of the equator the parallel of 18° north marks the transition between the Sudan and the desert.

Africa south of the Cunene-Zambezi line shows a general resemblance in build to Central Africa, but there are very notable differences in the human geography, owing to the latitude, the elevation and the effects of these on climate and vegetation. As in the central area the eastern side of the plateau is higher than the western, rising in the Drakenberg to over 10,000 feet. But the absence of the Rift Valley, which has so modified drainage conditions further north, means that in the lower latitudes the drainage of the interior finds a direct exit to the east coast. Two large rivers in particular, the Zambezi and the Limpopo, cut through the plateau edge, and debouch on fairly wide coastal plains, which are hot and unhealthy, with minor lakes and coastal lagoons.

Further south the plateau edge approaches the coast, leaving in Natal but a narrow plain, from which the Drakenbergs rise steeply. To the south-west the edge may be regarded as sweeping round to become the Sneeu-bergen (Snow Mountains) and Nicuweld Mountains. To

the south of these lies, not a coastal plain, but a terrace or lower plateau, forming the Great Karroo (2,000–2,500 feet). This, again, is bounded to the south by an upland region, formed by an old, much denuded, folded mountain belt. Its most conspicuous elements are the Zwarteborgen to the north and the Langebergen to the south. Between the two lies a longitudinal valley, drained by the head-streams (the Groote and Olifants) of the Gouritz river, which finds an exit to the sea through a gorge in the Langebergen. This valley forms the Little Karroo, a region of steppe-like character similar to the higher Great Karroo. Between the Langebergen and the sea, as also to the north of Cape Town, there is a moderately wide coastal plain. The fold-mountains just mentioned are interesting because, apart from the Atlas in the extreme north-west, they afford the only evidence of mountain-making processes in the resistant plateau-land of Africa. They seem, however, to be much older than the Atlas.

On the west the coastal plain, except in the extreme south, is very narrow. The plateau edge behind rises to a maximum height of about 8,000 feet in the area lying inland from Walvis Bay. Further inland the land sinks again to a great basin which corresponds topographically to the Congo basin, but owing to the dry climate is without outlet to the sea, forming a basin of interior drainage. Politically much of this basin is included in the Bechuanaland Protectorate, and geographically it forms the Kalahari desert, though it is mainly steppe-desert rather than desert proper. Though the rainfall is heavier on the higher land to the west it is not great enough to feed permanent rivers. Not till south of latitude 28° does the Orange river break through the plateau edge to reach the sea, after a long course on the surface of the plateau. It has two important right-bank tributaries, the Caledon and the Vaal.

From the central basin the land rises steadily towards the east, and the Transvaal, which is bounded to the north

by the Limpopo, and the Orange Free State, separated from it by the Vaal, as well as the eastern part of the Cape Province, all occupy these higher levels. Thus the Low Veld of the Transvaal rises to 2,000 feet above sea-level and the High Veld of the centre is at levels of from 4,700 feet to 5,700 feet. The Orange Free State varies between 3,500 and 5,500 feet. The elevation modifies considerably the temperature conditions.

CLIMATE. Bearing in mind that the range of latitude is from 18° to about 35° , and that the land mass is narrow, there is no difficulty in deducing the rainfall conditions. These again are reflected in the distribution of types of vegetation, which give a clue to the use which can be made of the land.

Along the east coast, so far south as the region where, in the vicinity of Port Elizabeth, the change in direction becomes marked, winds blowing in from the sea bring fairly copious summer rains. These winds have an easterly component, and the monsoonal indraft is naturally strongest in summer, when the temperatures on the surface of the plateau are high. Durban, with a mean annual total rainfall of 40 inches, has no absolutely dry season, but the precipitation is insignificant in June and July. It represents conditions on the coastal plain, and the upper, eastward-facing, slopes of the Drakenberg get an even heavier total fall. But after the crest is passed, and we enter the area where the plateau begins to slope westward towards the central basin, marked changes occur. The rainy season, without losing its limitation to the warmer period of the year, becomes shorter, the total fall diminishes, and the rains also become much less reliable, the amount varying greatly from year to year.

The aridity naturally becomes much more marked on passing towards the central basin, the so-called Kalahari desert. It is, however, less marked there than on the very narrow coastal plain on the west, where the neighbourhood of Walvis Bay has practically no rain at all,

while the Kalahari has about 10 inches or even more. The aridity of the coastal strip is largely due to the cold Benguella current. Onshore winds with a westerly component blow here throughout the year, but as the land is warmer than the air which has travelled over the cold current, no rain falls, though there is fog and mist.

The change which occurs as the land rises towards the interior is shown by the fact that Windhoek has 15 inches per annum, falling mainly in the period January-March, that is in the southern summer and autumn.

While these conditions prevail over the greater part of South Africa, the extreme south-west, with its winter rains and summer drought, shows a marked contrast. A line drawn from near Port Elizabeth, through Beaufort West to Warmbad near the Lower Orange river, and then striking the west coast in the vicinity of Lüderitz Bay, cuts off the area where the summers are dry and such rain as falls is winter rain. But much of this region has a very small total fall (Port Nolloth, 2 inches). Cape Town has 25 inches per annum, Knysna, on the south coast, in a region noted for its forests, 28 inches, but the rainfall diminishes rapidly towards the interior.

NATURAL VEGETATION. The distribution of types of vegetation is mainly influenced by the rainfall conditions. On the east coast the presence of a warm coastal current, which raises the temperatures, and the fairly abundant rainfall permit tropical vegetation, including forests, to extend far to the south. West of Port Elizabeth this type of forest, adapted to a régime of summer rains, gives place to a narrow belt of evergreen "Mediterranean" forest, showing great resistance to summer drought. The trees are of old-fashioned type, including especially members of the Protead family, represented as fossils in Europe. The silver tree, so called from its silvery, drought-resistant leaves, is one of the most interesting of these. Many members of this family occur also in Australia. South-west Africa is also particularly rich

in members of the heath family, forming the Cape heaths grown in our greenhouses.

The east coast forest type gives place on the plateau to dry grasslands, becoming more luxuriant towards the north. But inland from the evergreen forest belt of the south and south-west coast the rains are insufficient for extensive growth of grasses. On the Karroos, especially, a kind of bush-steppe is present, with short-stemmed, drought-resistant shrubs, and a multitude of bulbous plants and other herbaceous forms which become gay with flowers after the rains, but present a dusty and dried up appearance during the long summer drought. Much of the Kalahari also shows stunted, thorny and highly drought-resistant shrubs, with very limited grassland areas. The coastal desert strip on the west bears very little vegetation at all, a very remarkable dwarf shrub called *Welwitschia*, with only two leaves, which continue growing throughout life, being one of the most interesting. This is the only part of the world in which it is found, a very curious example of limited distribution.

PRODUCTS. It is clear from this account that agriculture in South Africa can have but a limited extension, and that stock-rearing is the main use to which the lands can be put. The coastal plain and lower slopes in Natal produce sub-tropical and even tropical crops ; sugar-cane, particularly towards the north, in Zululand, tea, maize, many kinds of fruit, and acacia or wattle, the bark of which is used in tanning, all occur. But the area concerned is comparatively small, and the total white population of Natal is not large. Round Cape Town Mediterranean crops, notably wheat and the vine with a great variety of fruits, can be produced. In the damper, eastern areas of the plateau, in the Transvaal and Orange Free State, maize, some wheat and fodder crops can be grown, but agriculture is generally precarious without irrigation, and irrigation in South Africa is not easy. Southern Rhodesia produces

tobacco and maize. So far as livestock is concerned, sheep, cattle, and the Angora goat for hair are most important. Ostriches can be reared with success, but the value of their feathers depends much upon fashion. Had it not been for its mineral wealth, indeed, South Africa would be economically of small importance.

POLITICAL UNITS. The most important part of the territory south of the Cunene-Zambezi line falls into the Union of South Africa, made up of the Cape of Good Hope, the Orange Free State, the Transvaal and Natal. The mainly arid area in the west forms South-west Africa, a mandated territory administered by the Union. The central Bechuanaland Protectorate, with a small total population, and very few Europeans, is mainly a stock-rearing country (cattle, sheep and goats), and is ruled by native chiefs under a Resident Commissioner. The enclave of Basutoland, a rugged region where Natal, the Cape Province and the Orange Free State meet, is a Crown Colony. European settlement is prohibited, but there is a fairly dense native population, the Basutos rearing sheep, goats, cattle and horses and producing a variety of cereal crops, including wheat, maize and millet (Kaffir corn). Swaziland, to the south-east of the Transvaal, has again a mainly native population, but in addition to stock-rearing carries on a considerable amount of cultivation, the crops including cotton, tobacco, maize and others. It is stated to be rich in minerals, as yet but little exploited, though stream tin is exported.

Portuguese East Africa extends far south of the Cunene-Zambezi line, the part included here consisting mainly of a wide coastal plain. The ports afford outlets to British territories in the interior. Thus Beira, on the Pungwe river, is the outlet for Southern Rhodesia as well as for Nyasaland, and Lourenço Marques, on Delagoa Bay, is the outlet for the Transvaal, being linked to the South African railway system. The southern part of Portu-

guese East Africa is also an important recruiting ground for labour for the Transvaal mines.

Of the two Rhodesias, the Southern only is included in South Africa in the sense defined. It is much the more important of the two, and has now responsible government, and a considerable European population. That of Northern Rhodesia, the lands lying beyond the Zambezi, is meantime small.

UNION OF SOUTH AFRICA

The total area covered by the Union is nearly half a million square miles; but the figure is of small importance in view of the aridity of large parts, and the small population. More than half the total is included in the Cape Province, which has the lowest density of population, only about ten per square mile. Natal, on the other hand, though the smallest of the provinces, with a total area of about 35,000 square miles, has much the highest density, over forty per square mile. The total population of the whole Union is about seven millions.

More important even than the small total population is the great predominance of natives, mainly Bantu negroes, here called Kaffirs. Europeans do not much exceed $1\frac{1}{2}$ millions, and even so are not homogeneous, consisting of Boers, or settlers of Dutch descent, with whom have blended Huguenots of French origin, and British peoples. The Boers are mainly pastoral farmers, the British are mainly engaged in trade and the mining industry, and there is a want of sympathy between the two. Almost all manual labour is done by Kaffirs, so that there is little opening for the emigrant without capital.

The relief has made railway development costly and difficult, and it is the mineral wealth which has made the construction of the fairly close network in the east possible. On the western side, where the population is thin, there are fewer lines, but the trunk line of South-west Africa is

now connected to the South African railway system, and sends out branches to the coast at Walvis Bay and Lüderitz Bay. From Cape Town the main line of the Union ascends the plateau by a somewhat difficult route, and branches at De Aar junction. North-westward this junction is connected with the railway of South-west Africa across the Orange river. To the east it is linked with the somewhat elaborate network of the eastern, better-watered area of the Cape Province, and sends also north-westward a main line passing through Kimberley, Johannesburg and Pretoria, which has a branch to Lourenço Marques, and continuations in the Northern Transvaal. A line runs nearly due north through Kimberley and Mafeking to Bulawayo in Southern Rhodesia, whence one line runs to Salisbury and Beira, and the other, passing the Wankie coalfield, to Livingstone, near the Victoria Falls of the Zambezi, and through Northern Rhodesia into Katanga (p. 252). Kimberley is also linked to the Orange Free State railways through Bloemfontein, and thus to the Natal system.

Ports in South Africa are comparatively few, and placed at some distance from one another. The chief are Cape Town, Simon's Town, to the east of the Cape peninsula, a naval station, but not well suited for a commercial port, Port Elizabeth, East London, Durban and Lourenço Marques.

The chief exports of the Union are gold, mainly from the Transvaal mines, and much the most important item, wool, especially from the eastern part of the Cape Province, diamonds, produced chiefly at Kimberley, hides and skins, Angora goat hair, with maize, but the amount of maize exported varies enormously from year to year. Maize, or mealies, forms the chief food of the native population, so that much is absorbed locally. Of recent years wheat exports from South Africa have been quite unimportant. To this general account short notes on the separate provinces may be added.

Cape Province. The capital, Cape Town, which is the seat of the South African legislature, has a population of about 200,000 and is the second largest town in South Africa, Johannesburg being the largest. The mineral wealth of the Province includes the diamond deposits of Kimberley, the copper of O'okiep, in an arid region to the north-west, the copper being exported from Port Nolloth, and coal. Coal is especially worked near Molteno in the east, but is not of very good quality.

The Orange Free State has as its capital Bloemfontein. It is fairly well watered and a good deal of agriculture is carried on. The minerals include diamonds and coal.

The Transvaal. Pretoria is the capital and the seat of the government of the Union, but is a much smaller town than Johannesburg, on the Rand, which has now about 300,000 inhabitants. Gold is present, especially in the long ridge of the Rand (Witwatersrand), where it occurs in conglomerate rocks which have to be crushed by powerful machinery. Coal occurs near the field, a point of great importance.

Natal has Pietermaritzburg as its capital, a town standing at an elevation of over 2,000 feet, but Durban is a much larger town (over 150,000). Coal of good quality occurs near Newcastle and Dundee to the north-west, and though not within very easy reach of the coast it is largely used as bunker coal at Durban, and is also exported to Asiatic ports. The white population in Natal is increasing with some rapidity, though it is very largely outnumbered by Kaffirs. There are also a number of Asiatics, who came originally to work on the plantations and in the mines, but are now chiefly occupied in retail trade and market-gardening.

SOUTHERN RHODESIA

This has an area of about 150,000 square miles, with a population of over one million, including about 40,000 Europeans. The elevated tablelands, from 4,000

to 5,000 feet in height, are well suited to Europeans and a good deal of settlement is taking place. Mineral deposits are extensive, including gold, coal, asbestos, copper and many others. Much of the land is well suited to cattle, which are extensively reared, and there is a developing dairying industry. In addition to maize and tobacco, cotton, ground-nuts and fruit-trees, including oranges and lemons, can be grown. Salisbury is the capital.

See Official Year Book of the Union (Pretoria) and *Guide to South and East Africa* (London), both published annually; also article by E. A. Walker in *Scottish Geographical Magazine*, January, 1930; Lehfeldt, *Natural Resources of South Africa* (London, 1922); Lucas, *Historical Geography of British Colonies*, Vol. IV, revised (Oxford, 1915).

PART IV
NORTH AMERICA

CHAPTER XVII

GENERAL SURVEY OF NORTH AMERICA

THE continent of North America is separated from Asia only by the narrow Bering Strait, but 36 miles wide at its narrowest point ; the two continents may be said to be linked together by the festoon of the Aleutian Islands, which extend from the Alaskan peninsula to the similar Kamchatkan one. In structure much of North America shows a curiously exact correspondence to parts of Europe and Asia, and there is also a close resemblance in natural vegetation and climatic types. From the standpoint of human geography, however, the contrasts between the Old and New Worlds are very great.

When European man first reached North America he found it inhabited by comparatively small numbers of Indian peoples. These were at a higher stage of culture than the aborigines of Australia, for they carried on a certain amount of agriculture. Two of their crop-plants in particular, maize and tobacco, have proved an enormous addition to the resources of civilisation, and maize has been carried to almost every part of the habitable world, and has become the main bread-plant of a variety of peoples. But the number of plants cultivated by the Indians was small, and, a point of very great importance, they possessed no stock animals. No wild horse types exist in either North or South America, so horses, donkeys and mules were necessarily excluded. But there are wild sheep in the Rocky Mountains ; countless herds of bison roamed the plains ; a kind of wild pig occurs in the southern United States ; innumerable reindeer, or caribou

as they are called in America, still live in the far north; yet the American Indians had no domesticated cattle, no sheep, no pigs, and had never learnt to tame the reindeer or the musk-ox of the north. For animal food they were dependent on hunting and fishing, and they had no woollen clothes, using the skins and furs of wild animals.

Again, though the continent has proved very rich in coal and many kinds of minerals, including iron, copper, gold and silver, the Indians could not smelt iron, and were in the Stone Age of culture. Thus the outstanding feature of North America, as compared with Europe, Asia and North Africa, is that the utilisation of its vast natural resources has been very recent. Developments have been rapid in what is now the United States only within the last century and a half, and in Canada they were slow till the beginning of the present century. Throughout it has been Europeans who have shown that enormous tracts of land are suitable to Old World crops unknown to the Indians; that the great grasslands can carry large herds of stock animals; that the sources of energy, in coal, in petroleum, in natural gas, in water-power, can be used not only to develop the mineral wealth, but to work up the stores of raw material into manufactured goods.

It was natural that, separated as it is from Europe by the broad Atlantic Ocean, the growth of the first European settlements in North America should be slow. But it is remarkable that although colonies were founded in what is now Eastern Canada and what is now the Eastern United States at practically the same time, the latter area should have soon taken, and maintained, the lead. It might be supposed that the contrast had its basis in the less favourable climate of Canada; but this is not in reality the essential point. It is the difference in the structure of the two which has had the greatest effect on their history.

STRUCTURE AND RELIEF. North America has been

described as an enlarged mirror-image of much of Europe ; but it shows a broad simplicity of structure and relief not attained in the smaller and more varied sub-continent. So much do the two appear like parts of a former whole that it has been suggested by Professor Wegener that they were once united. According to him North and South America were, in a long-past period of geological time, united to Europe and Africa respectively, but were severed from them by a great rift, and moved away westward, the rift widening till it became the Atlantic. To the north the rift branched so that the wedge-like block of Greenland separates the two continents. But in the case of South America he believes there was merely a fracture and a separation of the parts, so that the eastern prolongation of Brazil marks as it were the piece cut out of the Gulf of Guinea in Africa. Though the details of Wegener's hypothesis, of which this is but a small part, are beyond our scope, the fact that it has been put forward is interesting because it helps to emphasise the similarity of the lands on the two sides of the Atlantic.

In North America the detailed resemblances to Europe are remarkable. Fig. 35, which should be compared with Fig. 1 (p. 7), shows the four major structural features. These are :—the Canadian Shield, corresponding to the Baltic Shield of Europe ; the Appalachian Highland, corresponding to the ancient fold mountains of Europe ; the Interior Plains, corresponding to the Russian plain and its westward continuation into East Anglia across North Germany ; the Pacific Cordillera, corresponding to the young folded mountains of Europe.

The Canadian Shield consists of a great mass of hard, highly resistant rocks, crystalline in character, which have undergone no folding or notable change in character since the beginning of Cambrian time, and are therefore themselves of pre-Cambrian age. This Shield occupies by far the greater part of Central Canada—a fact of great human importance—and extends into the United States in the

region to the south and west of Lake Superior, and also to a much smaller extent in the east in the Adirondack Mountains of New York State. These hills are an outlying part of the Shield, linked to the remainder by a narrow belt across the St. Lawrence river.

As obvious points of resemblance to the Baltic Shield (p. 88), apart even from the constituent rocks, we have the presence of Hudson Bay, recalling the Baltic and Gulf of Bothnia, and a belt of lakes which, as in Europe, marks the junction between the old rocks of the Shield area and the younger stratified rocks of the plains. The Baltic Shield, we saw, is separated from the Russian platform by the large lakes Onega and Ladoga, which, with the White Sea and the Gulf of Finland, form a very obvious line of separation. The figure shows that a similar belt of lakes, of which Great Bear Lake, Great Slave Lake, Athabaska Lake and Lake Winnipeg are conspicuous members, margins the Canadian Shield towards the inner plains. .

The Appalachian Highland is a region of complicated structure, corresponding to two belts of folding in Europe. There the ancient Caledonian range can be traced from the north of Norway through Scotland and northern England to Ireland. Similarly the Hercynian or Armorican chain can be traced from the Polish Upland, through Germany, Belgium and France to south-western England, South Wales and south-western Ireland. In the last two areas the chains are in contact with each other, the older, the Caledonian, lying to the north of the younger or Hercynian (Fig. 1). When they reappear on the Atlantic coast of North America we find that they actually cross (Fig. 35). The Caledonian range reappears in Newfoundland, the Maritime Provinces of Canada and New England. Further south the Hercynian chain appears, and crossing the Caledonian chain near New York, appears to the west of it as the Pennsylvanian or Newer Appalachians with their rich coal-beds.

The Great Interior Plains extend in Canada from the western edge of the Shield to the Pacific Cordillera, and from the western edge of the Appalachians to the Cordillera in the States. Northward they extend to the Arctic Sea and southward to the Gulf of Mexico, from

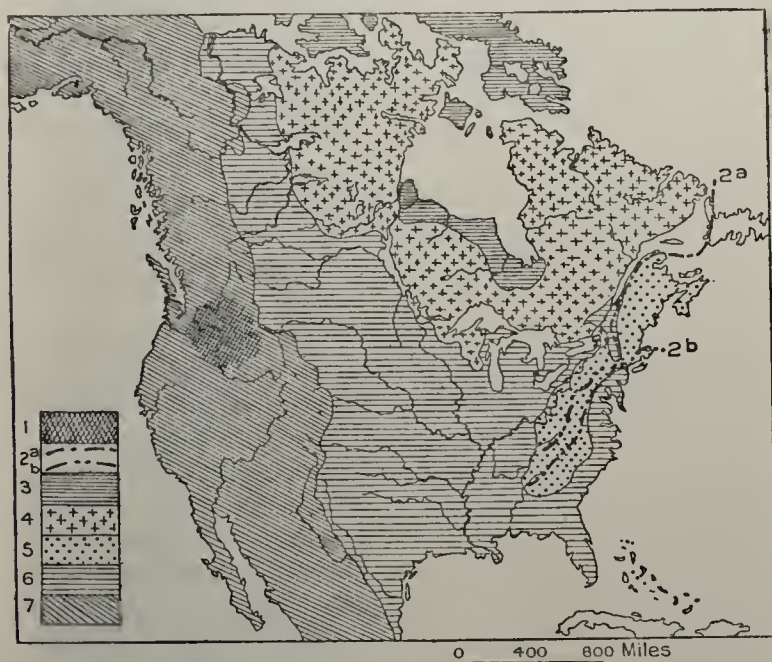


FIG. 35.—THE STRUCTURE OF NORTH AMERICA.

The four majorelements are : 4. The Canadian Shield : 5. The Appalachian Highland ; 6. The Interior Plains, and 7. The Cordillera. 1. is the lava plains of the Columbia-Snake region (p. 279) ; 2a, the Caledonian front ; 2b, the Hercynian front ; 3. the Hudson Bay and Arctic Plains.

whose shores they are continued into the Atlantic coastal plains. These plains, it should be noted, like the Russian platform, are floored by rocks of different ages, the younger beds lying towards the western mountains. They are believed to be overlying a deeply-sunken part of the Shield, but the special feature is that the beds are lying in a nearly horizontal position, with no folding

or deformation. The same type of structure appears round Hudson and James Bays, and in the Arctic archipelago, where the edges of the Shield were sunk in past geological times and sedimentary rocks were deposited on its margins. From the structural point of view, therefore, these regions are but separated parts of the great plains. So far as their human geography is concerned, however, the difference is enormous. The greater part of the Interior Plains, save where climate forbids to the far north, are valuable arable or grazing lands. The Arctic archipelago is rugged and ice-bound, yielding little except furs, and the belt round Hudson and James Bays is deeply clothed with glacial deposits, and has so little slope towards the Bays that it is badly drained, swampy, and useless.

The Pacific Cordillera consists of a great belt of young mountain folds, extending for about 4,300 miles, from the north-western corner of Alaska to Central America. Except for its direction, which is mainly south-easterly, it shows a general resemblance to the great chain which crosses Eurasia from west to east. In width it varies from 400 miles to a maximum of about 1,100 miles. The maximum width is attained in about latitude 40°, where the marginal chains diverge most widely, leaving between them the Great Basin. The width here does not greatly exceed that of the plateau of Tibet, but the elevation is very different. Thus Lhasa approaches 12,000 feet above sea-level, while Salt Lake City is not much above 4,000 feet. But the Great Basin must not be thought of as merely a depression between mountain chains, for it is itself crossed by a number of short parallel ranges.

The Cordillera consists generally of two western chains, separated by plateaus of varying width from an eastern chain, the Rocky Mountains. The outermost or most westerly chain is the Coast Range, which is largely submerged to the north, where it emerges in the Queen Charlotte Islands and Vancouver Island, while further

south it separates the Californian Valley from the sea. Further to the east lies the range called the Cascades to the north and the Sierra Nevada further south. In Canada the region between the Cascades and the Rocky Mountains is generally narrow, but in the States it widens greatly in the Great Basin area. Further, while in the north the Rockies form a single chain, south of 43° they divide into two main chains, enclosing a plateau traversed by the Colorado river. In Central America the chains swing round to the east and are continued into the West Indian Islands.

The Pacific Cordillera does not reach the heights of the Asiatic Mountains, Mount McKinley in Alaska, with a height of 20,000 feet, being the culminating point of the continent. Numerous volcanoes occur along the chain, and round the Columbia and Snake rivers, near the international border, an enormous outpouring of lavas forms a great basaltic plateau between the Rockies and the Cascades.

DRAINAGE. This description of the relief makes the drainage conditions easily intelligible. The presence of high mountain ranges, including plateaus or basins, is associated, as in Asia, with areas of interior drainage, but these occupy a much smaller space. Only some five per cent. of the continent is without exit to the sea, as compared with about 30 per cent. of the total area in Asia. The phenomenon of the disappearance of great rivers in the sands, so marked in Central Asia, is not an American feature. The main regions of interior drainage are the Great Basin, a part of the Mexican high plateau and a smaller area in southern Arizona and northern Mexico.

The position of the western Cordillera means that by far the greater part of the continent is drained to the Gulf of Mexico, the Atlantic and the Arctic Ocean, the Pacific rivers being generally small. But the Yukon, the Columbia and the Colorado are western rivers which may be called great even by American standards. The interior

plains of the United States are drained mainly by the Mississippi-Missouri system. The Mississippi, with a length from the source of the Missouri of over 4,000 miles, is the longest river in the world. It rises on the southern margin of the Canadian Shield, in the region west of Lake Superior, but its volume is greatly swelled, and its usefulness as a means of communication enormously increased, by the right and left-bank tributaries, draining respectively from the eastern side of the Rockies and the western one of the Appalachian Highland. Of the former group, many streams are gathered up by the Missouri, the Arkansas and the Red river coming in separately lower down. Of the left-bank tributaries the Ohio is much the most important. In Canada the northern part of the plains is drained to the Arctic chiefly by the mighty Mackenzie, of comparatively small importance because of the way in which it opens into an ocean practically useless for navigation. In the more southerly part of the Canadian plains the Saskatchewan and the Red river, after its junction with the Assiniboine, drain into Lake Winnipeg, from which the Nelson flows to Hudson Bay.

As compared with the great rivers of the plains, those of the Atlantic slope of the Appalachian Highland appear insignificant, though they have proved of much importance as highways to the interior. Particularly noteworthy is the Hudson, with its tributary, the Mohawk. Both afford easy ways of crossing the barrier of the Appalachians, the latter giving a route to the shores of Lakes Ontario and Erie, and the former by way of Lake Champlain (Fig. 36) to the St. Lawrence. The St. Lawrence itself flows between the south-eastern margin of the Shield and the Appalachian Highland, and thus appears to form an admirable route to the interior, without the need of crossing the Appalachians. It flows out of Lake Ontario, the last of the great chain of five lakes on the border between Canada and the United States. Lake Erie is connected with Lake Ontario by the

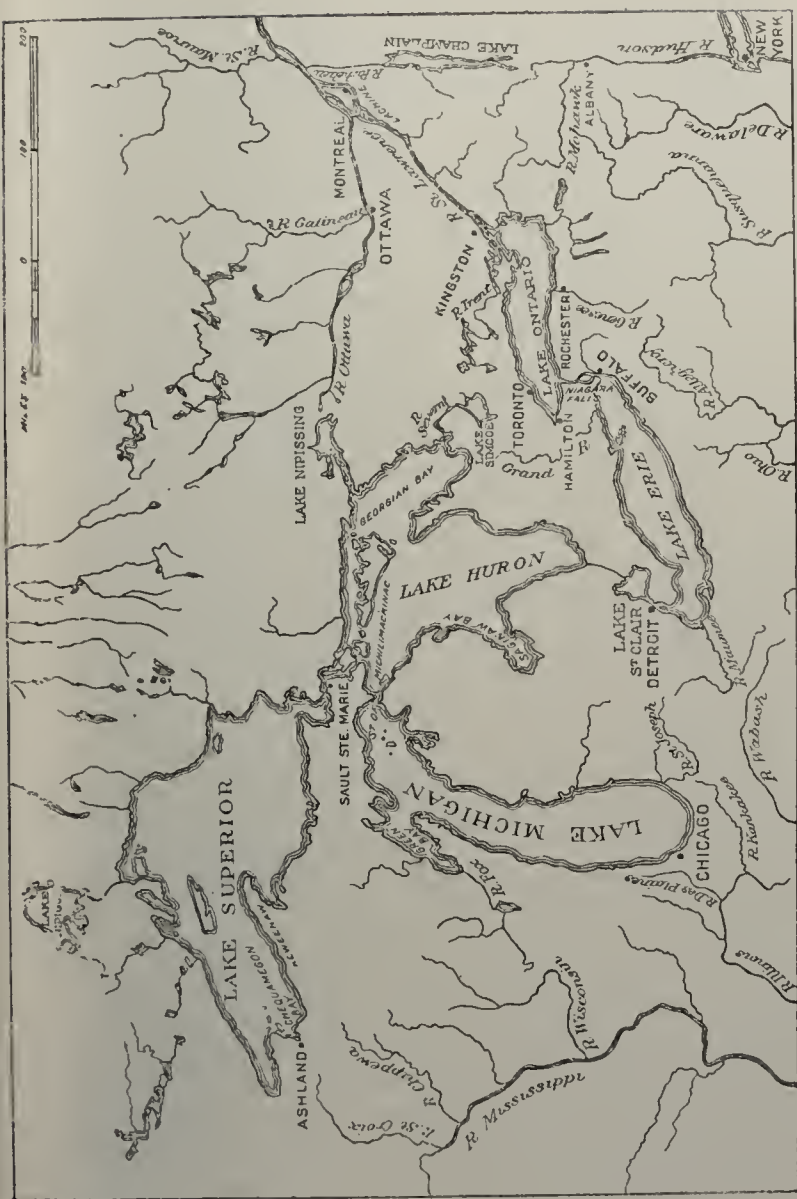


FIG. 36.--THE GREAT LAKES AND SURROUNDING AREA, TO SHOW NATURAL ROUTE LINES.

Note the short route from Montreal to Georgian Bay via the Ottawa, as compared with the long route via Lakes Ontario and Erie; the route from New York to Montreal via the Hudson, Lake Champlain and the Richelieu River, and from New York to Lake Ontario or Lake Erie via the Hudson and the Mohawk.

Niagara river, interrupted by the great Falls. Lake Erie is in its turn linked to Lake Huron by the Detroit River, the small Lake St. Clair and the St. Clair river. Lake Huron is connected to the southward-pointing Lake Michigan by a wide strait, and with Lake Superior by the St. Mary river, which has rapids on its course. At present, now that the obstacles to navigation have been got over by canal construction—by the Sault Ste. Marie, or “Soo” canals between Lake Superior and Lake Huron, the Welland canal to avoid Niagara Falls, and the series of canals necessary because of the rapids on the St. Lawrence between its exit from Lake Ontario and the town of Montreal—the St. Lawrence-Great Lakes waterway is of enormous importance. But two facts should be noticed. The first is that these canals date only from the 19th century, and till their completion there was no through waterway from the St. Lawrence at Montreal to Lake Superior. Second, as a route to the west from the St. Lawrence the water-line is exceedingly circuitous. The French Canadians in most of their voyages of discovery shortened it by reaching the Georgian Bay arm of Lake Huron direct by way of the Ottawa river and a portage (Fig. 36). In all this region the drainage conditions have been profoundly modified by the ice of the glacial period. At the time of maximum glaciation the ice extended well to the south of Lake Michigan. As it retreated new drainage channels were successively established, and the present lines are of quite recent origin.

CLIMATE. The mainland of North America extends beyond 70° north, and the Tropic of Cancer just touches the peninsula of Lower California, crosses the plateau of Mexico, and, after passing to the north of the large island of Cuba, intersects the Bahama group. Thus, since Lower California is in Mexico, no part of the United States lies within tropical latitudes, though the peninsula of Florida extends to latitude 25° . The extremity of that peninsula is in the latitude of Esna in the Nile valley, and the fact

reminds us that the great tropical desert area of North Africa and Arabia is not represented in North America. This is due to the presence of the Gulf of Mexico, which not only influences greatly the climates of the lands to the north, but gives the narrow, isthmian belt which links North America to South a relatively high precipitation.

But though North America corresponds in latitude to Eurasia without the three great tropical peninsulas which prolong the latter far to the south, the relief brings some striking modifications of the climatic types as compared both with Europe and temperate Asia. Thus the continuous western mountain belt forms a barrier to the penetration of the westerlies to which there is nothing to correspond in Europe. No great continental seas like the Baltic and the Mediterranean carry ocean influences far into the interior; nor are there any wide gaps in the chain which might fulfil a similar function on a smaller scale. Thus the western marginal and the Mediterranean types of climate are limited to narrow strips near the coast, and to the east of the Rockies the interior (continental) type of climate appears with great suddenness.

Again there is no transverse barrier, like the Alps and the Asiatic chains, so that Arctic influences from the north and Gulf influences from the south have free access to the interior. That prolongation of the Arctic Ocean which forms Hudson Bay also, itself ice-bound for much of the year, brings Arctic influences well into the interior. Finally, though the Appalachian Highland has great structural importance, its effect on climate is small.

As a result of the relief conditions there is, even in the south, little to correspond to the regular monsoonal reversal of the wind circulation which is so characteristic of eastern and south-eastern Asia. There is a tendency for the winds to blow inwards in summer and outwards in winter in the south and south-east, but a regular seasonal reversal is rendered impossible by the constant passage of cyclones across the continent, associated with great

changes in wind direction and weather. Such cyclones seem to be more frequent, and to move with greater rapidity in North America than in any other continent, apparently because of the great uniformity of the relief of the interior and the free exposure both to the Arctic Ocean and the warm Gulf. The cyclones tend to move across the continent in an easterly direction, and are particularly attracted towards the Great Lakes and the St. Lawrence valley. Their passage is associated with great and rapid changes in temperature, and they are especially developed in winter. What are called in America "cold waves" tend to appear in the rear of the moving depressions; that is the passage of a cyclone may be accompanied by an influx of cold northern air which brings sudden and great falls of temperature even in the lower latitudes. Rapid and non-periodic changes in temperature are indeed very characteristic of North America, and make average figures very unreliable as a guide to actual conditions. The fact that such sudden drops of temperature are much less marked to the west than to the east of the Rockies gives California, despite its more northerly position, advantages over Florida in the cultivation of the more delicate fruit-trees, such as oranges.

The temperature range between summer and winter is less marked in North America than in Asia, apparently because of the greater narrowness of the continent. The range is least marked on the west coast, and most marked in the interior (Table VIII and Fig. 37). The south and east are liable to "hot waves" in summer, that is to inflows of warm and moist air from the ocean. The rise of temperature then may not be very marked, but the humidity makes the heat very trying.

East of the Rockies the total rainfall diminishes from the east and south-east towards the north and west. A line starting from the coast of Texas in about longitude 97° and extending to longitude 101° in the north of the

States, and then bending westward in Canada, marks approximately the division between the eastern area, where rainfall is sufficient for agriculture, and the arid high plains to the west, where irrigation is necessary. The greater part of the interior has a rainfall maximum in early summer, especially June, the winters being dry, though not rainless. To the east of this area, in the States, there is a greater total fall, with a late summer maximum, but a good deal of rain in winter. In Eastern Canada, round the St. Lawrence area, the precipitation is evenly distributed throughout the year, and there is a heavy winter snowfall. On the coast, in Nova Scotia and New England, the maximum fall is in winter.

TABLE VIII

AVERAGE TEMPERATURES OF HOTTEST AND COLDEST MONTHS AND MEAN ANNUAL RAINFALL of stations in the United States in about latitude 40° . The precise position of each of the stations should be carefully noted, and temperature ranges calculated.

Station.	Height above sea level in feet.	Mean annual rainfall in inches.	Mean temperatures.	
			Hottest month.	Coldest month.
San Francisco	207	23	59.3°	49.5°
Sacramento ..	71	19	72.5°	45.6°
Salt Lake City	4,366	16	75.5°	29.0°
Denver ..	5,272	14	71.8°	29.6°
Omaha ..	1,103	30	76.5°	20.5°
Indianapolis..	822	41	76.1°	28.4°
New York ..	coast	$42\frac{1}{2}$	74.5°	30.3°

On the Pacific coast so far south as latitude 42° there is abundant precipitation, well distributed throughout the year, but with a winter maximum. To the south, so far

as about latitude 34° , this gives place to the Mediterranean type, with winter rains and accentuated summer drought. Then comes an arid belt, extending well into the interior, which south of latitude 25° gives place to the region of

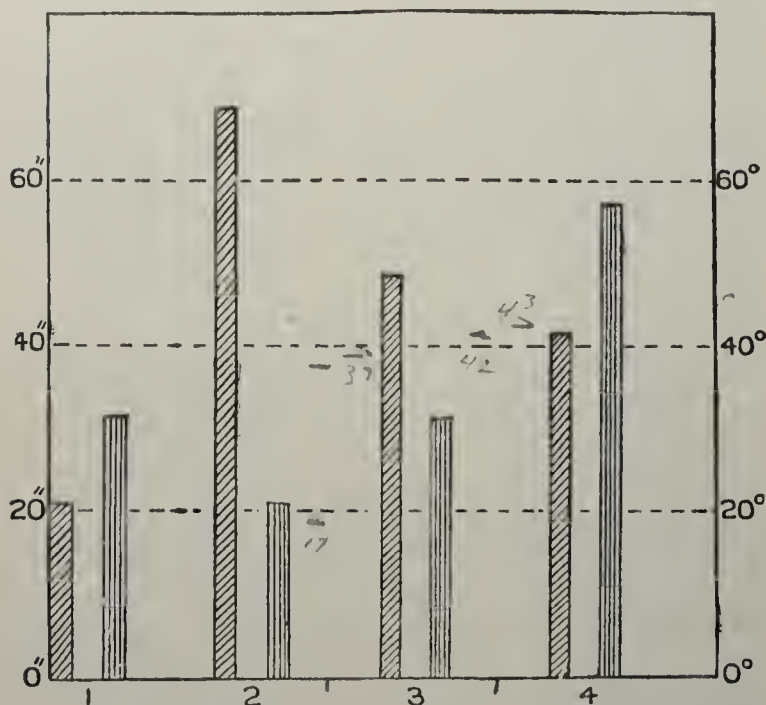


FIG. 37.—TEMPERATURE RANGE AND TOTAL ANNUAL RAINFALL AT STATIONS IN CANADA IN LATS. 45° – 50° .

1. Victoria; 2. Winnipeg; 3. Toronto; 4. Halifax. In each case the left-hand column shows temperature range and the right-hand column total rainfall. Note that the stations at Halifax and Victoria are at similar heights above sea-level (under 100 ft.); Toronto is 350 ft. above the sea, Winnipeg 1,500 ft. Victoria, in a sheltered position, has, despite its westerly situation, a much lower total rainfall than Halifax, which is more exposed.

tropical summer rains. Within the actual mountain belt the conditions vary very much with the relief and degree of exposure to rain-bearing winds, but the inter-montane plateaus tend to be dry. The aridity increases to the south,

reaching its maximum in the desert area of Arizona. Even British Columbia has a definite "dry belt" in the interior, with less than 10 inches of rain; but the lower temperatures here diminish evaporation and make the aridity less marked than to the south.

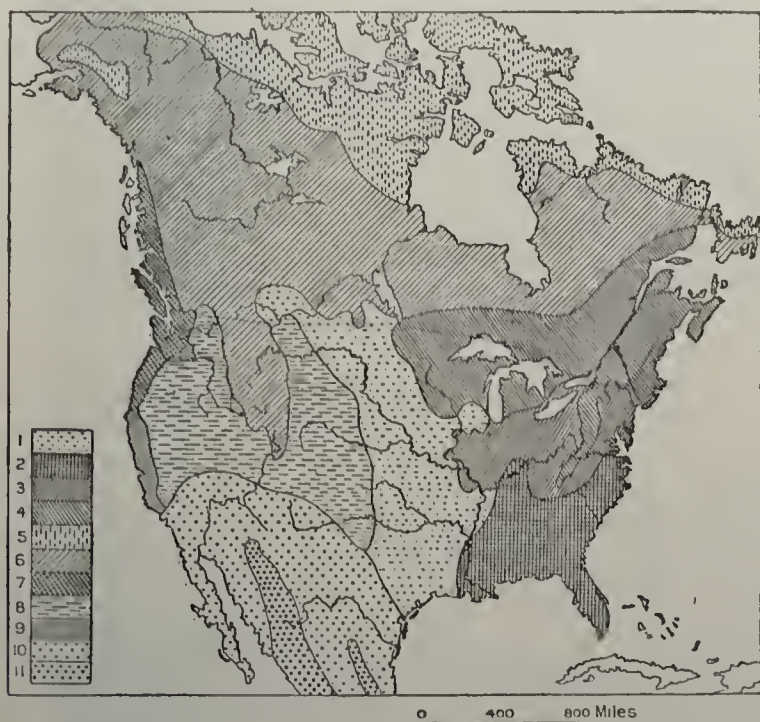


FIG. 38.—THE VEGETATION BELTS OF NORTH AMERICA.

1. Grasslands ; 2. Sub-tropical overgreen forest ; 3. Magnolia forest ; 4. Mixed forest ; 5. Tundra ; 6. Northern coniferous forest ; 7. Western coniferous forest ; 8. Steppo and bush steppo ; 9. Scrub forest (Mediterranean) ; 10. Desert ; 11. Tropical forest.

VEGETATION BELTS. The distribution of vegetation types in North America (Fig. 38) emphasises the points just made in regard to the climate belts. In the extreme north the zones show a latitudinal arrangement, comparable to that which occurs in Eurasia, and the actual

plants present are in many cases the same. But throughout the greater part of the continent the contrast between east and west is very marked, and the vegetation zones tend to show a longitudinal rather than a latitudinal direction.

In the north, as in Eurasia, lies the tundra belt, with permanently frozen sub-soil, without trees but with a multiplicity of shrubs, especially members of the heath family. The name "Barren Grounds" is commonly used in America instead of tundra, but not a few of the shrubby plants present are identical with those of Europe and Asia. As in the two other continents berry-bearing shrubs are important; the crowberry may be mentioned in particular. In the north-west the tundra belt is narrow, but it widens to the east, where the presence of Hudson Bay causes the tree limit to retreat southward.

South of the Barren Grounds lies the stunted coniferous forest, the equivalent of the taiga of Asia, here often called the sub-Arctic forest. It consists of pines, larches and spruces, with an admixture of birches and poplars. Many of the tundra shrubs also extend into it. In the region of the Mackenzie delta this forest belt extends to the Arctic Circle, but in the Hudson Bay region its northern limit is pushed south below latitude 58° , much further south than in eastern Asia. This northern forest not only extends into Alaska, but stretches southwards in the west along the mountain belt.

South of the taiga belt conditions differ notably on the east and west sides of the continent. We may begin with the eastern side, where forests have a more varied development than in the west. In eastern Canada, including the southern and eastern part of the Shield, and the Maritime Provinces, and in the north-eastern United States, there is, or was, a luxuriant mixed forest, consisting of a combination of conifers and broad-leaved trees. This belt hardly extends north of latitude 51° , and has thus a more limited range than the similar forest



TRANSPORTING LOGS BY SLEIGH TO WATERWAYS IN WINTER IN NORTHERN
ONTARIO

The forest shown in the background is part of the Northern Coniferous
belt of Fig. 38. *Photo supplied by the High Commissioner for Canada.*



LUMBER ON THE RIVER OTTAWA, SUMMER VIEW

The logs are carried to the streams over the snow-covered ground in
winter, and are transported downstream in rafts after the thaw sets in.

Photo by H. F. Newbigin.

in Russia (Fig. 18). Among the important trees are white pine, red spruce, beech, ash, sugar maple, elm and many others. The number of hardwoods increases notably towards the south, and this belt includes the chief hardwood trees of Canada.

Further south, in the eastern United States, the hardwood element in the vegetation increases greatly, at the expense of the coniferous, and we come to the belt of deciduous forest. This includes a great number of species, many very beautiful, and some, like the magnolias, of great interest because similar forms occur as fossils in Europe, where they are now absent, and are still found in eastern Asia. It is believed that this deciduous forest is, as it were, a relic of the rich forest which in the Tertiary period was widely spread over the northern hemisphere. In Europe it disappeared as the result of the Ice Age, probably because the Mediterranean Sea prevented the more delicate trees spreading southwards as the northerly latitudes became too cold for them. In North America such a slow process of migration southwards with the spread of glaciation was possible, and the trees have been able to extend northwards since, thus recovering ground previously lost. This forest type extends, in a narrow band, into Canadian territory along the northern shore of Lake Erie. On the other hand, the Canadian mixed forest extends southward along the crest of the Appalachians, where the climate is too cold for the more delicate hardwoods. Among these mention may be made of magnolias, tulip tree, Judas tree, many kinds of oaks, American walnut, hickory, plane, American chestnut, mulberry, American ash, and many others.

Still further south this deciduous or magnolia forest gives place to an evergreen forest, of sub-tropical character, which is rich in delicate varieties of conifers, and on the coast includes even some palms.

From the narrower forest belts of the west these eastern forests are separated by the grasslands and steppes of

the interior plains, as well as by the more varied vegetation types of the high mountains. There is no sudden break, but west of the Mississippi, especially north of St. Louis, the woods begin to be interpenetrated by grasslands, and the latter gradually predominate. Northward, that is in Canada, the limit of the treeless grasslands is about latitude 55° . As a convenient approximation it may be said that in Canada the town of Edmonton marks the region where the treeless grasslands begin to give place to the northern coniferous forest, while the town of Winnipeg is near the westerly limit of the eastern forest, and marks the beginning of the prairies. In the States, Illinois, though east of the Mississippi, has large tracts of prairie.

Westward, with increasing elevation, the grassy prairies pass into the drier High Plains, and these merge into the plateaus and basins of the mountain zone. Coniferous forest occurs here on the higher slopes, or those exposed to rain-bearing winds, but large tracts are covered with vegetation of the steppe type, with highly drought-resistant forms, especially sage-brush. This passes southward into true desert vegetation, with a remarkable development of cactus types.

The actual western coastal strip, especially to the north, in British Columbia, Washington and Oregon, is remarkable for its luxuriant coniferous forest, the trees often reaching a gigantic size. Hardwoods are exceedingly few. Very important is the Douglas fir, a magnificent tree, also Sitka spruce, cedars, pines, and many others. In California it is in this belt that the gigantic Sequoia and redwood occur. Both in Canada and the United States this splendid softwood forest forms a comparatively narrow strip along the coast. As the climate becomes hotter and drier, luxuriant forest, except on the mountains, gives place to an evergreen "Mediterranean" type, highly resistant to the summer drought. This in its turn passes into the sub-tropical desert type of

vegetation found in much of Mexico. Further south the tropical forest which occupies much of Central America makes its appearance in response to increased precipitation.

POLITICAL UNITS AND THEIR ORIGIN. As compared with Europe the political composition of North America is exceedingly simple, and frontier lines have little or no relation to natural features. That this is so is readily seen by noting that for much of its course the international boundary between Canada and the United States follows the parallel of 49° north—that is, it is a purely artificial line. The present territorial divisions have resulted largely from a series of historical accidents, and the degree of development of the different units has been greatly influenced by the possibility of access to fruitful lands which resulted from the frontiers as drawn.

European contact with North America may be said broadly to have occurred in four separate areas. (1) The French approached by the St. Lawrence, and their chief settlements were on a narrow strip between Quebec and Montreal. The great disadvantage of this area is that it is backed by the infertile Shield, which is rocky and has had its drainage so modified by glacialiation that there are swamps, lakes and streams innumerable, making it very difficult to cross. To the French the interior was chiefly valuable as a source of furs, and settlement was scarcely attempted by them outside the narrow strip of plain near the river. When Canada became British, settlement took place on the northern shores of Lakes Ontario and Erie, but the obstacle of the Shield was not overcome till the Canadian Pacific railway was completed in 1885. Not till then was it possible to reach the valuable prairie lands easily through Canadian territory. The limited amount of productive land to the east of the Shield, and the difficulty of access across it to the fertile prairies, may be said to be the main causes of the delay in the development of the Dominion.

(2) The first English colonists settled on the coastal plain, narrow to the north and widening southward, between the Appalachian Highland and the Atlantic. Here again, especially in New England, the amount of productive land is small, the climate relatively unfavourable to cultivation. The Dutch were the first settlers in the Hudson river area, where the Mohawk valley affords a good line of access to the interior, but they were soon absorbed. The great advantage of this coastal belt, which was the nucleus of the United States, was that the Appalachians south of the Mohawk valley soon proved far less of an obstacle than the Shield, and penetration into the fertile plains of the interior, with their varied resources, was rapid. It was this penetration, and the resultant settlement, which enabled the people of the United States to take that lead in the continent which they have never lost, and to push ever further and further towards the west.

(3) The Spaniards found an entrance by the Gulf of Mexico, but it was the gold of the mountain belt which was the great attraction in their case. The search for gold brought them into areas generally arid, and capable of comparatively little cultivation and settlement. Mexico, the third state of the continent proper, may be regarded as the remnant of the Spanish conquests, much of the Spanish area having been absorbed by the United States.

(4) Finally, as one would expect from the relation to Asia, the Russians advanced into Alaska in the extreme north-west, where fishing and sealing constitute an important part of the resources. Alaska was purchased by the United States in 1867; its frontier with Canada is mainly artificial.

The net result is that if Mexico is essentially the southern part of the western mountain belt, with a prolongation into the isthmus, where a series of smaller republics also occur, the physiographic regions of the continent as a whole have no relation to the frontier between Canada and the

United States. If the Shield is mainly Canadian, yet, as we have seen, it has minor prolongations in the States, and the Appalachian Highland, the interior plains and the Pacific Cordillera are common to both countries. Along the whole length of the international frontier, therefore, the physical resemblances between the two countries are great. As this is left the differences increase rapidly, particularly in the interior, where in the United States the productive plains widen and the lower latitudes and greater rainfall make the cultivation of a great variety of crops possible. In Canada, on the other hand, not only do the plains narrow northwards, but beyond latitude 55° little cultivation is possible. Also the greater variety of its resources and the much denser population have given to the States a development of industry to which there is as yet little to correspond in Canada.

See J. Russell Smith, *North America* (London, 1925); Ll. Rodwell Jones and P. W. Bryan, *North America* (London, new edition, 1928). Miller and Parkins, *Geography of North America* (New York, 1928). Wegener's book is translated as *The Origin of Continents and Oceans* (London, 1924). For an interesting structural comparison between Europe and North America, see E. B. Bailey in *Nature*, November 5, 1927, abstract in the *Scottish Geographical Magazine*, January, 1928, and another article in the latter, November, 1928).

CHAPTER XVIII

CANADA AND NEWFOUNDLAND

AREA AND DIVISIONS. The Dominion of Canada has a total land area of about $3\frac{1}{2}$ million square miles, equivalent to that of Europe. The fact is, however, devoid of practical importance in view of the enormous extent of unutilised land, much of which is unlikely ever to carry a dense population. The Dominion contains about $9\frac{1}{2}$ million people, a very remarkable contrast to the figure of about 120 millions for the United States, which cover a smaller area.

Canada is divided into nine provinces, and two vast but very thinly-peopled regions meantime organised as territories. The nine provinces may be grouped as follows :—

Nova Scotia, with which Cape Breton Island is included, Prince Edward Island and New Brunswick form the Maritime Provinces. They confront the Gulf of St. Lawrence and the Atlantic Ocean, cover together a very much smaller area than any other single province, attract few immigrants, and have shown in recent years less marked changes than the other provinces.

Quebec and Ontario constitute what is often called Eastern Canada. They are the largest and most densely-peopled provinces of the Dominion, and contain the largest and oldest cities. They are, however, far from homogeneous, for both, but particularly Quebec, include large areas of the Shield, and dense population is in both cases limited to a comparatively narrow belt.

Manitoba, Saskatchewan and Alberta form the three

prairie provinces within which agricultural developments have been exceedingly rapid in recent years.

British Columbia, which is not greatly inferior to the province of Ontario in size, includes mainly the mountain belt from the Rockies to the sea, but extends in the north-west into the interior plains. As in the prairie provinces, the population is increasing rapidly.

The territories consist of the Yukon territory in the north-west, and the vast but very scantily-peopled North-west territories, extending to the east of the Yukon and to the north of the prairie provinces.

DISTRIBUTION OF POPULATION. The largest element in the population (55 per cent.) is of British origin, but there is an important minority (28 per cent.) consisting of descendants of the original French colonists. French-Canadians live mainly, though not exclusively, in Quebec province, and constitute there the great majority of the population. A great number of other European nationalities are represented in Canada, and there are a considerable number of American Indians and some Chinese and Japanese.

As regards the distribution of the population, it should be noted that the fact that almost all the provinces are markedly heterogeneous in character makes figures of provincial densities of little value. As a corrective to the common belief that Canada as a whole is peopled by a scattered agricultural population it is worth note that in the census year 1921 almost half the population was described as "urban." The fact makes the distribution of the larger cities of some interest. Canada has two cities containing populations of over 500,000. These are Montreal (907,000), which is in Quebec province, and Toronto (about 557,000), which is in Ontario. Winnipeg, with a population (Greater Winnipeg) of well over 200,000, is in Manitoba. Three other cities, Vancouver, Hamilton and Ottawa, contain each well over 100,000, and of these Ottawa and Hamilton are in Ontario, Vancouver in British Columbia. Winnipeg and Vancouver have both ex-

ceptional site advantages, and the fact that of the six large towns of Canada no less than four are in the two provinces of Ontario and Quebec is an indication that the centre of gravity of the country as a whole lies in these two provinces. In point of fact the only part of Canada which as yet can be said to have a fairly dense population is the strip which extends along the St. Lawrence from Quebec upstream to the northern or Canadian shores of Lakes Ontario and Erie. The strip is generally narrow along the river, but has a notable expansion in what are called the eastern townships. These lie on the right-bank of the St. Lawrence, east and north-east of Montreal, and are traversed by the Richelieu and St. Francis rivers (Fig. 41).

This well-peopled strip corresponds to what are called the St. Lawrence Lowlands, a series of plains and moderate uplands which may be said to lie between the edge of the Shield and the Appalachian Highland. Physiographically the Lowlands are a north-eastern prolongation of the interior plains. They fall into three parts, the St. Lawrence Lowland proper, the area margining the river from Quebec to the point near the town of Brockville, where the Shield sends a narrow prolongation (p. 268) across the river to the Adirondacks of New York State; the Ontario Lowland, lying between the edge of the Shield and the lake; and the Ontario Upland, the triangular area bounded by the scarp over which the Niagara river plunges in the Falls, Lake Huron and Lake Erie. This last region reaches latitude 42° , that is practically the latitude of Rome, and has a genial climate. The total area of these St. Lawrence Lowlands is estimated at 36,000 square miles, or little more than one-hundredth of the total area of Canada, and they contain about 60 per cent. of the people of Canada. This strip is indeed the real heart of Canada, having excellent communications, both with the densely-peopled areas of the United States and with overseas lands, a great variety of resources, and

a combination of advanced types of farming and incipient industries.

The Maritime Provinces have also a fair density of population, Prince Edward Island, with 40 persons per square mile at the census of 1921, showing the highest provincial density. The remainder of the country is thinly-peopled, the density in the prairie provinces varying from two to three persons per square mile.

RESOURCES. Because of its small total population the exports of Canada form a fair guide to its products and resources. In other words the home market is small, and whereas in the States a very large amount of the products, natural, agricultural and manufactured goods, are absorbed at home, Canada must needs as yet produce mainly for an external market.

The exports from Canada fall into four main groups—agricultural produce, of which wheat is by far the most important; wood and wood products, especially paper and paper pulp; minerals and their products; animals and animal products, chiefly derived from the livestock industry. The first point which arises from this list is that Canada as a whole is only now developing as a manufacturing country. Such manufactures as exist are mainly those concerned with the working up, partial or complete, of home-produced raw material. The second point is that it is primarily an agricultural country; it has passed the stage when the collection and export of wild produce formed the main occupations. That such a stage existed not very long ago is suggested by the important place in the exports taken by wood and wood products. But it has to be noted that at the present time the amount of unmanufactured wood exported is less than that of paper and paper pulp, both derived from wood. What has been called "the miracle of paper" is indeed transforming the lumber industry of the country, and bringing population to hitherto unoccupied areas of the Shield. The "miracle" lies essentially in the use of water-power

to convert timber of little value or difficult transport into the easily transported commodity of newsprint, for which the demand, especially in the United States, is almost insatiable. As a third general point it has to be noted that the great importance of the minerals of the Dominion is not always realised. Here, again, the Shield area is rapidly becoming more and more important.

In the year 1926 agricultural produce formed about 46 per cent. by value of the total exports, wheat and wheat flour alone constituting one-third by value of the total exports. Canada is one of the great wheat-exporting countries of the world, and will probably increase and maintain its predominance in this respect. In the year named 37 per cent. of the imports of wheat into the United Kingdom and 50 per cent. of the imports of wheat flour came from Canada, while the United States supplied 32 per cent. of the wheat and over 25 per cent. of the flour. Of other agricultural products exported oats and flax seed (with some fibre) are notable, while fruits, especially apples, play a not inconsiderable part. Wood and wood products, including paper and paper pulp, accounted in the same year for about 21 per cent. of the total exports, while minerals and animal products each formed about 15 per cent. of the total. Animal products include cheese, living animals, bacon and hams, butter, hides and skins, that is commodities obtained from livestock-raising, and also natural produce such as furs (though fur-bearing animals are now reared on farms) and fish, especially tinned salmon and lobsters. The absence of any notable amount of wool is a remarkable contrast with Australia and the Argentine.

DISTRIBUTION OF RESOURCES. Taking then as our starting-point the conception that Canada has four basal sources of wealth, its arable lands, especially the wheat-lands, its forests, its grazing lands and its minerals, we have to consider the distribution of these.

Wheat is produced mainly in the three prairie pro-

vinees. This is primarily because parts of these have unequalled advantages for the production of grain on a large scale with the maximum use of mechanical methods and a minimum need for labour. Parts of the St. Lawrence Lowlands have excellent soils and a climate which permits of the production of wheat, but in the face of the competition of the virgin prairie lands, which require no manuring and no preliminary process of clearing, the farmers of Eastern Canada tend to devote their lands to a variety of crops, and to combine agriculture in the limited sense with dairying and stock-rearing, instead of concentrating on wheat (Fig. 39).

Of the three prairie provinces Saskatchewan now produces most wheat. The limit of the wheat belt extends from the international frontier south of Winnipeg in a north-westerly direction to the north-west of Saskatoon, and then runs generally westward, well to the south of the town of Edmonton. It then turns southward again, the town of Calgary marking approximately the western limit of extensive wheat cultivation. Along the northern side of the wheat belt mixed farming, with a certain amount of dairying, tends to prevail. In the south-west and south-east of Alberta, and parts of southern Saskatchewan, where the climate tends to be dry, ranching is the main occupation. In Alberta this is assisted by the chinook winds of autumn and winter, which are comparable to the foehn winds of the Alps. Air descending from the Rocky Mountains is warmed and dried by compression, and becomes a "snow-eater," so that the grass is exposed. Further, the chinook winds of autumn "cure" the grass stems as they grow, making natural hay, which forms good cattle feed. The surface of the land is also cut up into ravines, which give shelter to the cattle, so that these can be left out in a semi-wild condition. Though the losses by this method are great, the profits are also great in favourable seasons. A certain amount of irrigation is being carried out in this arid area, but wheat

is rarely grown on watered lands, which are used for more valuable crops, often fodder for dairy cattle.

Thus we must not assume that the whole of even the southern halves of the prairie provinces are given up to wheat production. The essential point is rather that there are very extensive areas well-fitted for this crop, and that with the admirable organisation of the wheat

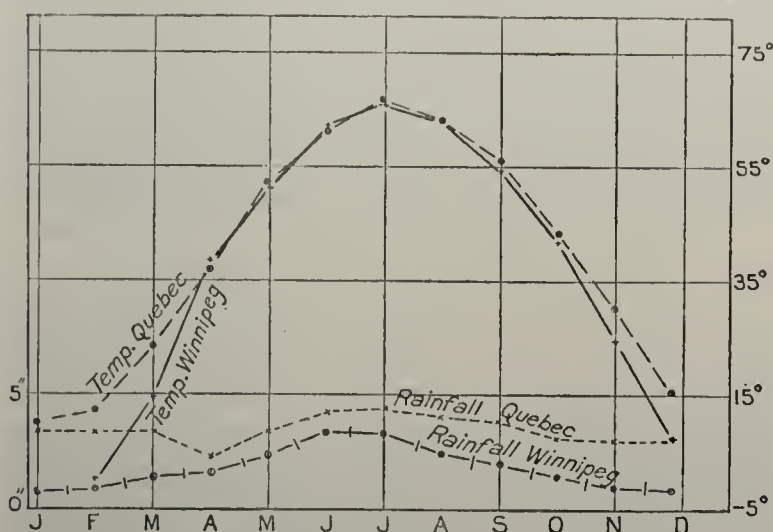


FIG. 40.—MEAN TEMPERATURE AND RAINFALL AT WINNIPEG (LAT. 50°) AND QUEBEC (LAT. 47°).

Note the low rainfall, with an early summer maximum, and the great range in temperature at Winnipeg.

trade it becomes profitable to push wheat cultivation to its climatic limits, specially suitable varieties of wheat being bred, and methods of conserving the limited soil moisture ("dry farming") practised. Winnipeg (Fig. 40) shows the typical prairie climate, the cold winters breaking up the soil, the melting of the winter snows moistening it for spring sowing, and the early summer rains promoting vegetative growth. The dry period in

August and September is important for the ripening of the grain and for harvesting.

In the mixed farming areas of the prairies oats and flax (chiefly for seed) are extensively grown. The mixed farming areas of the St. Lawrence Lowlands and the Maritime Provinces yield also the usual farm crops of temperate latitudes, such as potatoes and root crops.

Temperate fruits constitute another important Canadian crop. The main areas are Nova Scotia (especially apples), southern Ontario (grapes, peaches, pears, plums, as well as small fruits and apples), and parts of British Columbia, where again there is a considerable variety, the prairie provinces, in which fruit-growing is virtually impossible, forming a good market for the more perishable kinds.

The account already given of the forests of Canada (p. 288) makes clear the main facts as regards the country's timber resources. It has to be added that the hardwood element (beech, maple, elm, etc.) in the forests of the south-east has been largely cut out, and even the stands of white pine, the best softwood (coniferous) timber tree of the east, have been greatly reduced. The lumber industry of the east has thus undergone reduction, and British Columbia, with its magnificent coniferous forests, is now the most important province as a timber producer. On the other hand, it is in the east that paper and pulp production has made most rapid strides, Quebec and Ontario being the chief provinces concerned. For paper and pulp production large logs are not required; spruce and balsam fir are the species most used. The way in which the industry is growing is indicated by the fact that the exports in 1926 were five times as great as in 1916.

As factors which have assisted the exploitation of Canadian forests should be noted the winter snow-cover which aids transport, and the number of swift-flowing streams which can be used to transport the logs. Hydro-electric power is extensively used both in saw-milling and in the paper industry, and the multiplicity of falls where



WHEATFIELDS IN ALBERTA

As contrasted with Australia (Plate XV), it is necessary in the Canadian prairies to shock the grain for drying. Thus it cannot be threshed and bagged on the field as in warmer and drier climates.



ORCHARDS IN THE OKANAGAN VALLEY, BRITISH COLUMBIA

The Okanagan is a right-bank tributary of the Columbia River (p. 335). In British Columbia its valley, which is well-sheltered by the mountains, is remarkably warm and well suited for fruit. Since the rainfall is low, however, irrigation is required.

Photos supplied by the High Commissioner for Canada.

the streams descend over the margin of the Shield are thus of great value.

The mineral resources are very varied, and the Shield in particular has proved remarkably rich. Because of the developments there Ontario has now taken over the place formerly held by British Columbia as the leading province in mineral production. Alberta, Quebec and Nova Scotia also contain many minerals.

The Dominion has enormous reserves of coal, but the deposits have not been very fully developed, and are not well placed in relation to the densely-peopled strip of the St. Lawrence Lowlands. These areas can, however, obtain coal by water from the United States, and we have thus the apparent anomaly that Canada both exports and imports coal. Export takes place from the eastern and western fields which occur near the sea (Nova Scotia and British Columbia) or, as in Alberta and southern British Columbia, near the international frontier in regions where coal is not abundant in the States. In the province of Nova Scotia coal occurs in Cape Breton Island, near Sydney, and at Inverness, on the east coast, and also in the north of the peninsula. Some coal is also found in New Brunswick. Enormous deposits occur in Alberta, where the Crowsnest Field, which extends into British Columbia, is important as supplying fuel for the railways. There are also deposits in the Kootenay region of British Columbia and at Nanaimo in Vancouver Island. Iron ore is not extensively worked in Canada, the enormous beds in the States being near at hand. But Sydney in Cape Breton Island and New Glasgow in the peninsula of Nova Scotia have very extensive iron works, using Newfoundland ores and local coal.

Petroleum and natural gas, with salt beds, occur in southern Ontario, in the peninsula between Lakes Huron and Erie. Alberta has also petroleum wells, as to the south-west of Calgary and near Wainwright, and possesses much natural gas.

The ores of the Shield include nickel-copper beds at Sudbury, which yield 85 per cent. of the nickel supplies of the world ; north of the Sudbury region silver occurs at Cobalt and very rich goldfields in the Porcupine and Kirkland Lake area. There is no coal here, but abundant water-power is available. The western mountain belt, as throughout the continent generally, is richly mineralised, but the gold of British Columbia and of the Yukon (Klondyke) is not now of very great importance. The most valuable mineral of British Columbia at present is lead, mined especially in the Kootenay district, where improved methods of dealing with the refractory ores, which contain lead, zinc and silver, have been devised. Copper is also extensively mined in British Columbia, both on the coast and in the Kootenay area. Of minor mineral products the asbestos mined in the eastern townships of Quebec is interesting ; 80 per cent. of the world supply of this product is obtained here.

In regard to the animal products of Canada we need only note that dairying is most extensively carried on in the older lands of the east, particularly in the St. Lawrence Lowlands, which have easy access to the sea, and to a less extent in the Maritime Provinces. But it is being developed in the prairie provinces, to the north and east of the wheat belt, Edmonton being an important centre in the west. The prairie provinces supply a considerable amount of dairy produce to the mining and lumbering population of British Columbia. Fisheries are important on the Pacific coast (salmon canning) and also in the St. Lawrence Gulf and on the Atlantic margin. The northern forest belt still supplies large amounts of furs, Montreal and Winnipeg being important fur markets. Fur-farming, particularly of the Arctic fox, is a growing industry, Prince Edward Island being the great centre.

LINES OF COMMUNICATION. In order that these diverse and widely distributed commodities may reach the world market convenient lines of communication are

essential. The great waterway formed by the St. Lawrence and the Great Lakes extends from the Strait of Belle Isle to Fort William on Lake Superior, a distance of 2,250 miles. Ocean-going ships can reach Montreal, Quebec being mainly a passenger port, as the largest liners cannot negotiate the narrow navigable channel of the St. Lawrence between the two towns. The great disadvantage of this waterway is that it is closed by ice usually from about the end of November to the end of April, Halifax on the Atlantic coast of Nova Scotia being the winter port of Canada. Its use necessitates a long and somewhat difficult train haul from Quebec or Montreal.

On the west the great port of Vancouver is now beginning to compete with Montreal as a grain port as a result of the opening of the Panama Canal. Vancouver is always open, and in winter, when Montreal is closed, its influence extends as far east as Saskatoon, a distance of 1,050 miles. But in summer, when lake freights are cheap, it cannot compete with the eastern outlets, and its influence extends but a short distance into Alberta. A new railway has been constructed to Churchill on the shores of Hudson Bay, in the hope of finding there yet another outlet for prairie produce. But the period of ice-free navigation in the Bay and Strait is very short, and it is by no means certain that the route will prove to be commercially successful.

The eastern route, so far as its lake section is concerned, is, as already noted (p. 282), remarkably circuitous. Further, the Welland Canal between Lakes Erie and Ontario, which avoids the obstruction of Niagara Falls, will not carry the large lake wheat boats. Improvements of the Canal are in progress, but even when completed they will not wholly solve the problem, as the canals which avoid the St. Lawrence rapids between its exit from Lake Ontario and Montreal are narrow and shallow. Only a comparatively small part of the wheat of the west

takes the all-water route from Fort William to Montreal. Much of it is diverted to rail at the Georgian Bay ports, such as Parry Sound. Georgian Bay is an almost land-locked arm of Lake Huron from which a direct course can be steered to Sault Ste. Marie, and thus to Lake Superior. Much wheat also is transhipped at the American port of Buffalo on Lake Erie, and exported through New York instead of through Montreal. Various plans have been put forward to facilitate direct water-carriage by large lake boats from Fort William to Montreal. One suggestion is that a canal should be constructed from Georgian Bay, following the old French route (p. 282), via Lake Nipissing to the Ottawa river, and so to Montreal, which stands where that tributary joins the St. Lawrence ; another proposal is that the navigation of the St. Lawrence above Montreal should be improved.

The most interesting general point is that, both because of its circuitousness and the fact that the existing canals are not large enough to permit of the passage of the large wheat boats which can ply on the lakes, the theoretically continuous waterway from Lake Superior to Montreal is of less importance than it seems. The main lines of export may be summed up as follows. Some wheat is carried by an all-rail route from Winnipeg to Montreal. Of that which is put on ship at the ports of Port Arthur and Fort William, and is destined to be exported to Europe, a part leaves the water at the Georgian Bay ports and is carried by rail to Montreal. Another part goes by rail to New York from Buffalo, or to Montreal by rail from Port Colbourne at the Lake Erie end of the Welland Canal. The wheat of the far western area is now tending to be exported by an all-rail route from Vancouver, and the new Hudson Bay railway will give another possible exit for the north-eastern part of the prairie provinces.

So far as railways are concerned very great changes have taken place since the C.P.R. (Canadian Pacific

Railway) first connected the prairie provinces and British Columbia with Montreal, and in the developed part of the Dominion the railway network is fairly dense. There are now two main transcontinental routes with many branches and lateral connections. The C.P.R. main line runs from Montreal by the Ottawa river to Ottawa, the Dominion capital, beautifully situated on the river, with saw-milling industries and much water-power, derived especially from the Chaudière Falls on the main stream. Thence the main line runs to the mining centre of Sudbury, and through thinly-peopled country to the ports of Fort William and Port Arthur on Lake Superior. It then passes Lake of the Woods and attains Winnipeg, the great wheat centre, and a converging point of routes. Winnipeg lies at the junction of the Red river flowing north from the States, and the Assiniboine coming from the west. The united rivers flow into Lake Winnipeg and the proximity of the international frontier forces all traffic into the narrow bottle-neck commanded by the town. From Winnipeg, which is the capital of Manitoba, the line runs past Regina, the capital of Saskatchewan, to Medicine Hat in Alberta. Here it branches, the main route continuing through the ranching centre of Calgary with its petroleum refineries (p. 303) to Banff and the Kicking Horse Pass (5,300 feet) by which the Rockies are crossed. The Selkirks are crossed by another pass and the descent made to Vancouver. From Medicine Hat a branch takes off over the Crowsnest pass (4,410 feet), which connects up the mining district of southern British Columbia and also links up with the railway system of the States.

In the east, apart from its other numerous branches, the C.P.R. crosses the St. Lawrence at Montreal by a great bridge and runs direct to St. John, passing through United States territory. St. John is the largest town in New Brunswick (capital, Fredericton), and, like Halifax, with which it is connected, is ice-free in winter.

The other transcontinental route may be regarded as starting from Quebec as the main line of the Canadian National. It runs directly west across the northern part of the Shield, passing, as at Cochrane, through what is called the Clay Belt, i.e. that part of the Shield where old glacial lakes have left soft deposits which make some cultivation possible, as compared with the Shield as a whole which is too bare and rocky for cultivation. A certain amount of settlement is now taking place in this belt (Fig. 39). The Canadian National then runs fairly directly to Winnipeg by a northern route, and from that town in a north-westerly direction past Saskatoon to Edmonton, the capital of Alberta. It crosses the Rockies at the Yellowhead pass (3,700 feet), and sends one branch north to the small port of Prince Rupert and another to Vancouver. In the east a bridge across the St. Lawrence at Quebec carries a continuation of the railway direct to Halifax.

NEWFOUNDLAND

NEWFOUNDLAND, to which Labrador is attached administratively, is a large island with an area of about 43,000 square miles and a scanty population of about 260,000. It is chiefly important because of its fisheries, especially of cod, with salmon and halibut, and sealing on the coast of Labrador. The island is forested, and though the trees have no great value as timber they form a valuable source of paper pulp. Paper and pulp mills have been established, especially at Grand Falls on the Exploits river in the north-east. Minerals are abundant, and good iron ore (p. 303) is worked near St. John's, the capital. There is coal in the south-west, the fields being a prolongation of those of Cape Breton Island. Owing to the raw and foggy climate little cultivation can be carried on.

See H. M. Ami, *Canada and Newfoundland*, in *North America*, Vol. I, in Stanford's *Compendium of Geography*, also *The Canada Year Book*, Heaton's *Annual* and *The Atlas of Canada*. For the relation of the history to the geography see Newbigin, *Canada* (London, 1926).

CHAPTER XIX

THE UNITED STATES: STAGES IN DEVELOPMENT

AREA AND POPULATION. The contiguous territories of the United States cover to-day a land area of just under 3,000,000 square miles, or apparently much less than that of Canada. That the difference is apparent rather than real is clear when we recall that the North-west Territories and Yukon in Canada cover together an area of about $1\frac{1}{2}$ million square miles, with a total population in 1921 of only 12,000. In the States, it may be noted by way of contrast, the state with the smallest density of population is the mountainous one of Nevada, which with an area of 110,000 square miles has a population of 77,000. In other words, very large tracts of unoccupied land do not now occur in the States as they do in Canada.

In the census year of 1920, when the population of the States was about 106 millions, $10\frac{1}{2}$ millions were negroes, but there were only about 250,000 Indians, and about 200,000 Japanese and Chinese. The remainder consisted of persons of European descent or origin, every nationality in Europe being represented. Since 1924 immigration into the States has been restricted, preference being given to those coming from the north-western parts of Europe, regarded as more easily assimilated than the peoples of eastern and south-eastern Europe, who had been arriving in steadily increasing numbers in the years before restriction of immigration began. The negroes are all descendants of former slaves, and form a majority of the population in some of the southern states where slave labour was formerly extensively used.

CONTRASTS WITH CANADA. Any general survey of the States should start from the fact that there are certain broad general resemblances to the conditions already described for Canada, with a number of outstanding differences. The main differences may be shortly summarised. In the States the first settlements took place on the Atlantic coast, where a number of excellent, ice-free ports occur. Thus from the start external trade was important, whereas the French Canadians, settled along the St. Lawrence from Quebec to Montreal, were handicapped both by the distance from Atlantic routes and by the fact that navigation was limited to about half the year. Secondly, some of those first settlements were separated from the productive Interior Plains only by the Appalachian Highland, which proved to be easy to cross in certain areas. At first sight it might appear as if French Canada should have had an advantage in this respect, for the St. Lawrence, together with Lakes Ontario and Erie, affords a direct route to the plains without the need of crossing the Highland. But the direct route, though it was utilised by the French explorer La Salle, was rendered impossible for French settlers by the hostility of the Iroquois Indians, organised as the confederacy of the Five Nations. When the international frontier was finally drawn, as the result of the long struggle between French and English, followed by the revolt of the English colonists, Canada was separated from what became her prairie provinces by the Canadian Shield, while the people of the United States could pour through the breaks in the Appalachian Highland and occupy the plains without let or hindrance.

As a third point of contrast we have to note that the part of the plains now included in the States is more extensive, more varied and better favoured in climate than the Canadian prairies, so that it has a much greater variety of products. It has also better and more direct outlets. Just because the plains were easy to reach, easy

to develop, and had good outlets, the population, once immigration to them began, increased with great rapidity. In 1820 the population of the area which then formed the United States was $9\frac{1}{2}$ millions. A hundred years later it was, as just stated, nearly 106 millions, while now it approaches 120 millions. Again, partly because of this enormous population, the States show a development of manufactures to which as yet there is little to correspond in Canada. This development has been assisted by the easy communications between the older States of the Atlantic seaboard and the agricultural areas of the interior, with their great variety of products, and by the vast supplies of coal and iron, as well as of water-power, petroleum and natural gas.

To realise the meaning of these statements it is necessary to look in a little detail at the areas within which the early settlements took place, and to consider their relation to the Interior Plains, the great source of raw material.

THE ATLANTIC COASTAL AREA AND THE EARLY SETTLEMENTS. The original thirteen colonies which adopted the Declaration of Independence in Congress on July 4, 1776, extended in a strip along the Atlantic coast from the southern end of the Bay of Fundy to the beginning of the peninsula of Florida, and were limited landwards by the Appalachian Highland. Parts of this belt are now densely peopled, and the city of New York, by far the largest city in the States, stands upon it, just as Montreal, the largest city in Canada, stands on the strip first occupied by the French Canadians. The characters of this belt of early settlement in the United States are of great importance in attempting to grasp the direction in which expansion took place and its causes.

The first point to notice is that the coast-line trends generally from north-east to south-west, so that, for example, Boston in Massachusetts is 10° of longitude east of Savannah in Georgia. The characters of the coast differ also very markedly throughout its extension, so

that it can be divided into a series of regions. From the international frontier to the hook-like peninsula of Cape Cod the coast is rocky and broken, with a number of harbours, of which Boston is the most important; but with practically no coastal plain. Broadly, the Highland may be said to approach the sea, so that the rivers are unnavigable. There is also little in the way of fertile or level land, and the climate is harsh. The next strip of coast extends from Cape Cod to the mouth of the Hudson and shares the same characters with some minor differences. Thus the trend of the coast changes, being here almost east to west. The parallel rivers of the Connecticut and Hudson afford a marked contrast to the short streams of the first section, and both have tracts of fertile land along their courses. The Hudson (Fig. 41) is of enormous importance, both because of its navigability (for small steamers to Troy, Fig. 42), and because the valley of the main stream affords a line of access, via Lake Champlain (connected by the Champlain canal to the Hudson) and the Richelieu river, to the St. Lawrence near Montreal, and the valley of its tributary the Mohawk, an easy route to the shores of Lakes Ontario and Erie. The Erie Canal (see below) connects the Hudson with both lakes. Further, while there is no coastal plain in the strict sense, this is represented by the peninsula of Cape Cod and by the islands, especially Nantucket Island, Martha's Vineyard and Long Island. The last gives shelter to the channel of Long Island Sound, very important in early days for coastal traffic between the colonies.

Most of these two sections of coast fell into the colonies of New England, New York colony having but a small mainland frontage on the coast at either side of the Hudson river. The New England colonies, especially Massachusetts, were for long the most important, and the reasons are interesting because they are not altogether obvious. There was little fertile land and the climate permitted only a limited range of crops. As against these apparent



FIG. 41.—THE HUDSON-LAKE CHAMPLAIN ROUTE, WITH SOUTHERN NEW ENGLAND.

The forts marked are those which were important in the fighting between the French and the English.

disadvantages were the abundant wood for boat-building, the easy access to good fishing grounds, the presence of a market in the slave-owning colonies further south, where dried fish was a favourite food for slaves, and the water-power of the abundant streams. The character of the early population was perhaps the greatest asset of all, and the fact that because of the upland behind there was no hinterland into which spread could take place meant that effort had to be concentrated on making the best of the limited advantages of the coastal area.

New York colony possessed the great advantage of a splendid port with a navigable river leading into the interior; but the Mohawk valley was occupied by the powerful Iroquois Indians. The main significance of the colony in early days was that it was the great rival first of Quebec and later of Montreal in the fur trade, the furs being obtained by barter from the Indians. Not till the power of the Iroquois Indians had been broken could the route to the lakes by the Mohawk valley be utilised fully. In 1825 the Erie Canal was constructed from Albany, on the Hudson, along the valley line to Buffalo on Lake Erie, and then New York began to forge ahead and acquire the importance which railway development only intensified. The construction of the Canal meant that the great plains of the interior were already being settled; but the settlers had found an entrance mainly by routes placed much further south, not by this apparently natural line of access.

From the mouth of the Hudson southward the coast area shows marked changes, and can again be divided into two sections. Before describing these, however, we have to note the general contrasts with the northerly area.

The most obvious of these is that here there is a well-marked coastal plain. To the north of the Hudson mouth recent depression has occurred, so that the margin of the land is drowned beneath the sea. Southward

the amount of depression becomes progressively less and the coastal plain widens steadily. From the neighbourhood of Cape Hatteras the trend of the coast-line shows a close parallelism to that of the Highland. But south of latitude 34° , in Alabama and Georgia, the latter dies out, so that the Atlantic plain becomes continuous with the Gulf plain with no barrier between the two.

In the region between the mouth of the Hudson and the dying away of the Highland there is geologically and topographically a fairly well-marked distinction between the actual coastal plain, low-lying, floored by young, soft and undisturbed beds, and what is called the Piedmont plateau, which is in reality a much denuded part of the Highland, though its old and hard rocks are in parts mantled by younger beds. Between the two there is a low scarp, of great importance because the rivers tend to have falls or rapids on their course as they cross it on their way to the coastal plain. This, the Fall Line of American geographers, marks the limit of navigability of the larger rivers. The tide usually ascends to the Fall Line, so that it represented the limit to which early sea-going boats could reach. In a number of cases the early settlers found here, at a natural landing-point, a suitable site for a settlement, with wood, water and access to the sea. Another advantage lay in the fact that the falls or rapids of the river gave water-power, used of course directly in early days. The result is that the Fall Line can be traced even on a small-scale map by a row of towns, some of which are ports in the modern sense, while others cannot be reached by large modern boats.

We may note some of the more important of these towns (Fig. 42). Philadelphia stands on the Delaware river (Schuylkill tributary) at the Fall Line before the river enters Delaware Bay. The next river, the Susquhanna, enters Chesapeake Bay at the Fall Line, so that there is no room for a town to develop. Further south, however, the important port of Balti-

more is placed on the small river Patapsco, just below its rapids. The series of Fall Line towns is continued by Washington on the Potomac and Richmond on the James, both now only minor ports. The James river enters the extreme south of Chesapeake Bay, and south of this region (Fig. 43) inlets become progressively less and less marked, so that the coast-line tends to become continuous, and is swampy and unhealthy. Raleigh, Columbia, Augusta (on the Savannah river) and Macon continue the sequence of Fall Line towns, and their growing cotton manufactures speak to the significance of the water-power of their rivers, though it is of course now hydro-electric power, and is supplemented by coal.

This description makes clear the basis of the division of this part of the coast into two sections. From the mouth of the Hudson to the south of Chesapeake Bay the coastal plain is mainly developed in the form of peninsulas defined by the great inlets of Delaware and Chesapeake Bays. The actual sea-coast is sandy or marshy, not easy of access, and the land when reached is not very fertile or attractive. But the bays made it possible to penetrate to the edge of the Piedmont plateau behind, which includes productive areas, and the rivers gave, as we have seen, good sites for settlements at the Fall Line. Philadelphia, the centre of the colony of Pennsylvania, early became important, and though the State owes much of its present importance to the great coalfields much further inland, yet it has had from early days an important farming population, and supplied many of the settlers for the Interior Plains.

South of Chesapeake Bay, with the absence of bays running in to the Fall Line, a swampy and unhealthy coastal strip, and a hot and trying climate, European settlement was much less easy. The colony of Virginia, which developed round the rivers flowing into the western side of Chesapeake Bay, where the land proved well suited for tobacco, marks in a sense the transition to the

southern colonies of the Carolinas and Georgia, where settlement began as an extension of that of the West Indies, with a complete dependence on slave labour and a cultivation of sub-tropical crops, of which rice was at first very important, with indigo, cotton coming later.

THE APPALACHIAN HIGHLAND. We have already seen (p. 276) that the Appalachian Highland consists of the

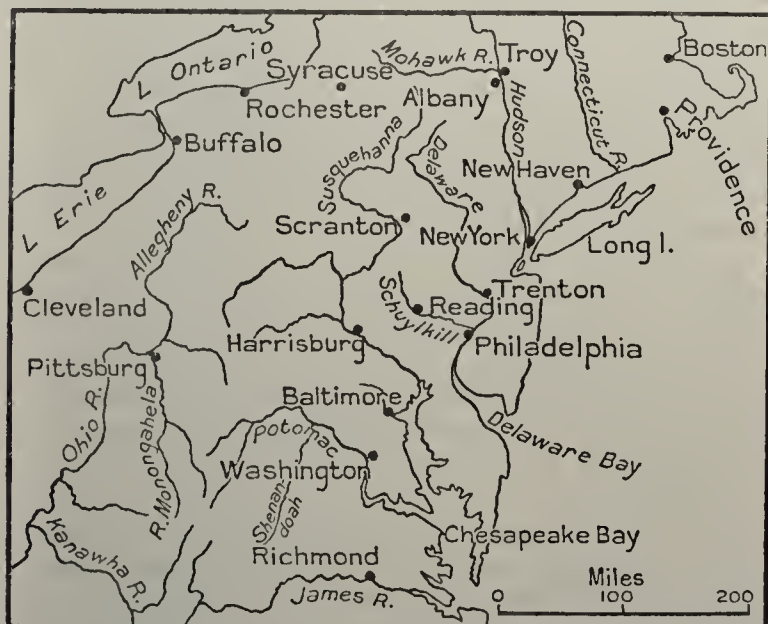


FIG. 42.—TOWNS OF THE NORTH-EASTERN UNITED STATES.

worn-down remnants of two mountain chains equivalent to the Caledonian and Hereynian chains of Europe, the older range, owing to the crossing near New York, being nearer the sea and the younger confronting the Interior Plains. From Virginia to its southern end the older chain forms what is called the Blue Ridge, rising behind the Piedmont plateau. This range is highest in the south, where it reaches a height of 6,700

feet in Mount Mitchell in North Carolina. Northwards it diminishes in height, and to the west of Philadelphia it is low and interrupted, forming the South Mountains, continued into the New Jersey Highlands.

The younger range to the west, owing to differential erosion of the varied rocks of which it is composed, can be divided into two longitudinal belts. The most westerly is the Cumberland-Alleghany plateau, which has generally a steep scarp towards the east and a gentler slope towards the Interior Plains. The easterly scarp bounds the remarkable feature called the Great Valley, or Appalachian Valley, which lies between the plateau and the Blue Ridge. This valley extends from north-eastern Pennsylvania to Alabama, is occupied by parts of a number of separate rivers, and is not level, for its surface is marked by a number of ridges, dividing it into parallel minor valleys. A curious feature is the way the streams which occupy the valley tend to turn at a sharp angle in order to find a means of escape either to the Atlantic coast or towards the Mississippi. The result is that both the Blue Ridge and the Cumberland-Alleghany plateau-scarp are notched by gaps, of great importance in the history of settlement.

The Great Valley is difficult to trace on a small-scale map as a continuous feature, and its presence is most easily realised by the course of the rivers. In the following description the present course of the rivers is indicated, but it should be realised that the valley owes its present form to a long process of erosion in what was originally a dome-shaped area. In other words, when we speak of a river cutting a gap through the Blue Ridge we have to remember that what actually happened was that the Blue Ridge became a ridge as the result of long-continued denudation in the central area. Within the valley also the ridges represent the more resistant rocks, the minor valleys the softer beds.

Three important rivers in the north, the Delaware,

the Susquehanna and the Potomac (the last with an important tributary, the Shenandoah), rise in the Cumberland-Alleghany plateau, enter the Great Valley by gaps, have a longer or shorter course within the valley, and then break through the Blue Ridge or its continuations in other gaps to reach the Piedmont plateau and the Atlantic. The James and the Roanoke rise within the valley, and after flowing along it for a certain distance similarly break through the Blue Ridge on their way to the Atlantic.

Very different is the course of the New-Kanawha. Its headstream the New river rises actually on the Piedmont plateau, cuts a way westward through the Blue Ridge, enters the valley, leaves it again by a gap through the scarp of the Cumberland plateau and flows to the Ohio.

Still further south the Tennessee arises by a number of headstreams, partly within the valley and partly from the western side of the Blue Ridge, here divided into a western section, forming the Unaka Mountains, Great Smoky Mountains and Bald Mountains, separated by an upland from the Blue Ridge proper to the east. The Tennessee flows for a considerable distance along the valley and finally finds an exit through the Cumberland plateau below the town of Chattanooga, and joins the Ohio not far above the confluence of that river with the Mississippi. Finally it has to be noted that the Ohio itself rises in the western part of the plateau by the two headstreams of the Monongahela and the Allegheny (Fig. 42), which flow from opposite directions and have the great city of Pittsburg at their junction, which was the site of the French Fort Duquesne.

THE SETTLEMENT OF THE PLAINS. This description indicates some of the possible lines of access from the early tide-water centres on the Fall Line to the interior. But the actual routes followed by the settlers were influenced by causes not wholly geographical.

The first point of interest is that, because of the relative unimportance of the Blue Ridge (p. 318) in the region west of Philadelphia, the Piedmont plateau there is almost continuous with the Great Valley—no difficult hill country has to be crossed. Now Pennsylvania attracted a number of settlers early, and as the nearer lands on the Piedmont plateau were taken up, the immigrants tended to move south along the line of the Valley, following the Shenandoah river, and reaching ultimately the region of the Tennessee headstreams. These settlers were farmers, actually occupying the land. Quite early, however, in the first half of the 18th century, some of the inhabitants of Pennsylvania and Virginia had learnt that it was easy to reach the Ohio headstreams via the Susquehanna and Potomac rivers and gaps, and so trade for furs with the Indians of the plains beyond. But the French of Canada also found it easy to reach the Upper Ohio from Lake Erie. The result was conflict between the two powers, with fighting in the area round Fort Duquesne. The immediate result was that just as the easy Mohawk valley route was stopped first by the presence of the Iroquois Indians, and second by the fighting between French and English which took place along it, so also the Upper Ohio region became an area of military importance rather than one into which civilian migration could take place. As a result we have the curious fact that the first important movements into the Interior Plains, in the latter part of the 18th century, took place in the south, by a difficult route.

The route led over what is called the Cumberland Gap, a name not found on most maps. The Gap lies where the three states of Virginia, Kentucky and Tennessee meet each other, and allows of passage from one of the headstreams of the Tennessee river within the Valley to the Cumberland river, a tributary of the Ohio rising to the west of the Cumberland plateau scarp. The pioneers here were attracted to the famous and fertile Blue Grass

Lands of Kentucky, where they settled. The result was that the region south of the Ohio was settled much earlier than that to the north. It was not till the 19th century, and especially after the construction of the Erie Canal, that the more northerly part of the plains was settled. In the year 1830 the town of Chicago contained only 70

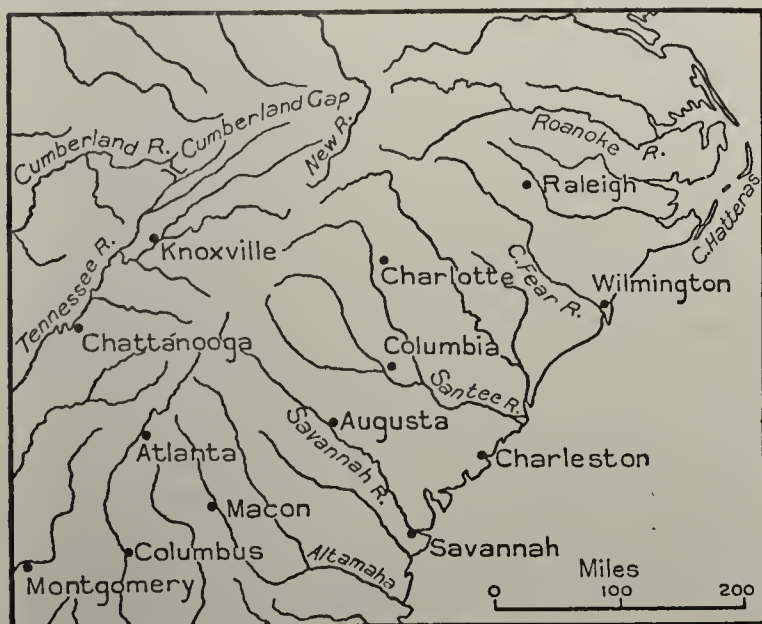


FIG. 43.—TOWNS OF THE SOUTH-EASTERN UNITED STATES.

persons. By the end of the century it contained one million. In the census year 1920 it contained 2,700,000 persons and was the second city of the States, very notably surpassing Philadelphia.

LINES OF COMMUNICATION AND THEIR DIRECTION.
The growth first of New York and then of Chicago at the expense of Philadelphia, and the rapid spread of settlement north of the Ohio were both associated with an increasing use of transverse routes, as compared with the

longitudinal one of the Mississippi. That predominance of transverse routes is indeed one of the striking features of the United States in view of the apparent value of the Mississippi system, and it is important to note that it did not become really marked till the railway era. During the first half of the 19th century the Kentucky settlers used mostly the navigable Ohio as a means of transport for their surplus agricultural produce. After the purchase from France in 1803 of the vast area beyond the Mississippi called Louisiana, cotton-growing became important in the Lower Mississippi area and the planters and their slaves formed a ready market for Kentucky corn and meat. The barrier of the Appalachian Highland largely isolated the early settlers in the plains from the older states on the Atlantic seaboard, so that there was comparatively little intercourse between the two. From the standpoint of the Atlantic States this was a dangerous position, for their lands were not comparable in fertility to those of the plains, and their only hope was to develop their manufactures and exchange manufactured goods for the agricultural products of the plains. First the Erie Canal and later the railways enabled those States to attach the plains to their sphere of interest, and New York began to take full advantage of its position.

The value of the Mohawk valley is clearly shown by the way in which the railway from New York to Buffalo and Chicago runs north for more than 140 miles along the Hudson in order to take advantage of the valley. The actual distance to Chicago via Philadelphia and Pittsburg is less, but the gradients are much heavier. With the rapid development of the plains north of the Ohio, Chicago became the railway centre of the Middle West. The fact that it has certain analogies—with very marked differences—to the much smaller Canadian railway centre of Winnipeg should be noted. It has the great advantage of access to the transverse waterway of the Great Lakes by Lake Michigan, and that waterway

is enormously important to the United States as we have seen it is to Canada. The rapids of the St. Mary river between Lakes Superior and Huron, it may be noted, are avoided by a canal on the American as well as on the Canadian side, and the "Soo" canals together carry more traffic than passes through the Suez. It should be noted also that Duluth, the most westerly American port on Lake Superior, is considerably further west than Fort William, the most westerly Canadian port.

After the occupation of the plains the most important event in the development of the States was the gold rush to California in 1849. The rapid exhaustion of most of the diggings led many of the incomers to settle down to farming, while the increase in population made the development of transcontinental railways a necessity. The first route, completed in 1869, was the Union and Central, which connects Chicago by Des Moines, Omaha and Ogden to San Francisco (Oakland). Two northern routes, the Northern Pacific and the Great Northern, start from St. Paul, on the Upper Mississippi, are also connected to Chicago, and reach the Pacific coast at Tacoma and Seattle on Puget Sound. Another transcontinental route starts from St. Louis, at the junction of the Missouri and Mississippi, connected directly both to Chicago and to Philadelphia via Pittsburg, and reaches the Californian valley by its southern end. San Francisco is also connected to the Gulf ports of Galveston and New Orleans.

The transcontinental lines do not convey a large amount of produce from the west to the east, the gradients over the mountain belt being very heavy. Their real importance lies in the sections which traverse the Interior Plains, and in their connections with the lake ports, particularly Chicago and Duluth.

SUMMARY. The main facts as to the development of the United States may thus be briefly summarised. The parts of the Atlantic coastal area best fitted for European settlement were not very fertile, but had good ports. In

Pennsylvania, in particular, it was easy to find an entrance into the Appalachian Valley, which contained relatively good land and enticed settlers southwards, as their numbers increased, till the Cumberland Gap afforded a difficult access to the Blue Grass Lands of Kentucky. Meantime the more natural entrance to the plains by the Mohawk valley was blocked by historical causes, which had their ultimate geographical basis in the fact that the Indians had already learnt that the north-eastern part of the plains was suitable for their agriculture, based on maize. There was a period, therefore, during the first half of the 19th century, when the settlers within the plains, mainly living south of the Ohio river, looked southwards towards the Lower Mississippi valley, and had little trade relationship with the older States of the Atlantic coast. After the Indians ceased to be a menace, and conflict among the European powers for the possession of the continent had also drawn to a close, the Mohawk valley leapt into importance, and a flood of settlers poured into the plains, to be followed later by further movements beyond the western mountain belt to the Pacific coast. Because first of their water-power and then of the great coalfields of the Appalachian area, the older Atlantic states responded to the competition of the better agricultural lands of the interior by the development of industry. But the rapid growth of Chicago and the other lake ports shows that the States of the Middle West are developing industry in their turn, for they also contain extensive coalfields as well as beds of iron ore. The agricultural belt is thus shifting westwards towards the arid belt at the base of the mountains, while the industrial area is spreading into the plains. Agricultural developments in the Pacific area are an independent phenomenon.

The Continental United States cover an area of about 3 million square miles with an estimated population of about 120 millions. Canada, with an area of $3\frac{1}{2}$ million square miles, has a population of $9\frac{1}{2}$ millions.

CHAPTER XX

THE UNITED STATES: REGIONAL STUDIES

MAJOR NATURAL REGIONS. What has been already said gives an indication of the major divisions of the United States. On the fundamental physiographical division into the Appalachian Highland, with its Atlantic margin, the Interior Plains and the Western Mountain Belt we have to superimpose a sub-division based on the facts of human geography. But the two schemes do not wholly correspond. Thus the fact that the Appalachian Highland does not extend to the Gulf means that the wide Atlantic coastal plain in North and South Carolina and Georgia is continuous with the Gulf section of the Interior Plains, and there is considerable resemblance in climate, products and human conditions throughout this belt. On the other hand, the northern, and particularly the north-eastern, section of the Plains shows marked contrasts with the Gulf plain and its continuation on the Atlantic coast, and the dry Great Plains of the west differ from both. Since for a generalised survey no refinement of classification is necessary, we shall recognise only the following as major regions :—The New England States ; the Middle Appalachian States, with a continuation along the Highland ; the Central Lowlands ; the south and south-east Lowlands ; the Great Plains of the arid west ; the Mountain and Plateau belt ; the Pacific coastal area, divided into Washington and Oregon to the north and California to the south.

NEW ENGLAND. The six States of Maine, New Hamp-

shire, Vermont, Massachusetts, Connecticut and Rhode Island constitute a very well-defined unit. The Appalachian Highland here is represented by two parallel ridges (Fig. 41), the White Mountains of New Hampshire, attaining in Mount Washington (6,300 feet) the highest point of the northern Appalachians, and the Taconic and Green Mountains, which separate the Hudson and Connecticut rivers. Agriculture is mainly of an intensive type, based on dairying, with fruit and vegetable production. Neither wheat nor maize, as a rule, does well, and though peaches are grown in the southern Connecticut valley, apples, pears, plums and small fruits are mainly produced. Maine is still well-wooded and produces paper and pulp, but much pulp is imported from Canada for paper-making.

The outstanding and characteristic feature of New England is the great development of its manufactures, all the more remarkable in that coal, iron and oil are absent, and much of the raw material used has to be brought from a distance. Water-power is still largely used, now in the form of hydro-electric power, but much coal is brought by sea from the Appalachian field. The manufacturing centres show a tendency to cluster round the coast or near to it in the south, where coal can be easily obtained. The main industries are the manufacture of textiles, leather goods, copper and other metal goods, and paper, and the persistence of these is an interesting example of industrial inertia, the social inheritance and the invested capital having much influence. Cotton goods are extensively manufactured at Lowell, New Bedford and Providence, cotton and woollen goods at Lawrence, placed like Lowell in the Merrimac valley, the river supplying much power. Boots and shoes are very largely made at Boston and neighbouring towns, such as Lynn and especially Brockton. Waterbury on the river Naugatuck is an important centre of metal goods, and Holyoke on the

Connecticut is a great paper centre. Boston (about three-quarters of a million inhabitants) is the chief port and city, but New England is largely tributary to New York for both imports and exports.

If the tradition which made New England, and Boston in particular, the centre of the intellectual life of the States still persists, the common assertion that it is the part in which the inhabitants are predominantly of English descent is, or was before restricted immigration was put into force, rapidly ceasing to be true. It has indeed been stated that on Boston Common on a Sunday afternoon every European language *except* English may be heard.

THE MIDDLE APPALACHIAN STATES. Strictly speaking this region should be regarded as including only the three States of New York, Pennsylvania and New Jersey, with their great mineral wealth, particularly the coal of Pennsylvania, and their associated enormous development of manufactures. We shall, however, include here also the southern prolongation of the industrial area. It should be realised that New York and Pennsylvania extend over the Highland to the shores of the nearer Great Lakes (Erie and Ontario), and that the Pennsylvanian coalfield extends into the State of Ohio, as well as into those of West Virginia and Maryland.

The largest and most important coalfield in the United States is that which lies in south-western Pennsylvania, centring round the town of Pittsburg. The coal is easily worked, of good quality and cokes well. It is of the bituminous type, but anthracite occurs in a detached field in the same State. This anthracite field, which has Scranton as one of the mining centres, lies north-west of Philadelphia, between the Susquehanna and Delaware rivers (Fig. 42). It forms the only extensive area of smokeless coal in the United States, and the product is very largely used for domestic heating in the eastern cities.

In the south-western coalfield petroleum and natural gas are also found, thus increasing the power resources.

Iron ores were originally abundant throughout the whole length of the Appalachian Highland, and this fact, with the presence of fuel and limestone as a flux, accounted for the beginning of the smelting industry of Pennsylvania. The local ores are largely exhausted, but enormous deposits occur to the north-west and south of Lake Superior within easy reach of the ports of Duluth and Superior. The ore, particularly in the productive region called the Mesabi Range, lies very near the surface and is so friable that it can be shovelled out, mining in the ordinary sense not being necessary. This ore is transported by the Great Lakes waterway to the shores of Lake Erie, within easy reach of the Pittsburg district. But in addition to this process of bringing ore to fuel, another condition occurs at such lake ports as Cleveland and Buffalo. These are the landing-places of the Lake Superior ore brought by boat, and are within easy reach of the Pittsburg coalfield. Steel works have in consequence been established here, though neither coal nor iron occurs actually on the spot.

The enormous supplies of fuel in Pennsylvania, and the lines of communication already discussed, account for the great development of industry in the three States of New York, Pennsylvania and New Jersey. Much of the labour, it should be noted, has been in the past supplied by immigrants from Europe. The leading industry is that of iron goods, the United States being the largest producer of iron ore and pig iron in the world. So far as manufactured iron and steel goods are concerned, the enormous home market, and particularly the rapid development of railways and the demand for machinery and labour-saving appliances in a country where labour is dear, should be noted. The great clothing industries of New York (over $5\frac{1}{2}$ millions), the leather industry of Philadelphia (1,800,000), the glass of Pittsburg are examples of other types of industry. New Jersey, with the adjacent part of Pennsylvania, has silk manufactures,

based on imported raw silk ; Paterson, New Jersey, and Seranton, Pennsylvania, are leading towns.

The Pittsburg coal beds are continued southwards along the line of the Highland, important fields occurring in West Virginia and in Alabama in the far south. Birmingham in Alabama has an important steel industry, coal, iron ore, limestone and timber for pit-props all being found in the neighbourhood. The West Virginian coal is little used for manufacturing purposes, being mainly exported. It moves northwards by rail to the shores of Lake Erie, where, together with Pennsylvanian coal, it is largely exported to Canada (p. 303). It is also sent to the coast, to the ports of Newport News and Norfolk at the mouth of the James river, whence it is carried to southern New England, and enters also into external trade, being sent even to Europe, at least at times.

Apart from these mining areas in the Highland, the Atlantic States to the south show as a whole a progressive decrease in industrial developments, and an increasing predominance of agriculture. This statement is, however, becoming steadily less true, especially in North Carolina and Georgia, where industries are developing rapidly. Some of the cotton-manufacturing towns of the Carolinas and Georgia have already been mentioned (p. 316) ; they are now competing seriously with the older cotton towns of New England. Baltimore in Maryland besides being a port has canning and preserving industries. Washington, the States capital (about 500,000), is in the District of Columbia, which belongs to no State. It has no important industries, being mainly an administrative centre. The tobacco industries of Richmond reflect the importance of the tobacco-growing of Virginia and North Carolina, though Kentucky is the most important producing State. In the States further south, apart from the abundant water-power, the labour supplied by the mountain folk has been an important factor in promoting recent industrial developments.

THE CENTRAL LOWLANDS. This region may be defined as extending westwards from the slope of the Cumberland-Alleghany plateau till, round about longitude 100° , the climate becomes too arid for cultivation without irrigation, and the surface rises to the Great Plains, the beginning of which in the Dakotas is indicated by the scarp of the Missouri plateau. Northwards the region extends to the International boundary, and if it is difficult in the south to draw a sharp line of demarcation from the Gulf Plains, the presence of the Ozark Mountains in southern Missouri and northern Arkansas affords at least a convenient land-mark. This great area may be said to possess as its main feature the fact that it contains large tracts admirably fitted for temperate crops, but that upon its agriculture has been superimposed, especially in the north-east, a certain amount of industry as a result of the mineral wealth.

The two outstanding crops are wheat and maize, or corn as the latter is called in America. There are two great wheat areas, one to the north-west, where the crop must be spring-sown, and one in the central and west-central area, where the climate permits of autumn sowing. The chief States concerned in the first case are North and South Dakota and Minnesota. The second belt is particularly developed in Nebraska, Kansas and Oklahoma, but extends also into Illinois, Indiana and Ohio, though there is a tendency for the area of greatest production to shift westward. Maize is not only the most important crop in the United States, but the country is the greatest world-producer, as it is of cotton. While maize is grown wherever the climate permits, the belt of maximum production partly separates the two wheat belts and partly overlaps the area of autumn-sown wheat. Illinois and Iowa are the States with the greatest production, but the belt extends eastward through Indiana into Ohio and westward into Missouri and Nebraska, sending a branch into Kansas and Oklahoma, continued into Texas.

Though maize is extensively used for human food in the States, its main significance is as fodder for pigs and cattle. The area of greatest production is thus closely associated with the great meat industries of Chicago, and the production throughout the corn belt implies an enormous amount of stock-keeping. Young cattle for fattening are largely sent to the corn belt from the Great Plains, where enormous cattle ranches occur.

The Central Lowlands are rich in coal. The most important field is the central one, developed in the States of Illinois, Indiana and the western part of Kentucky. The less important Western Interior field lies in Iowa, Kansas and Oklahoma, with a south-western extension into Texas, and there is another field in Michigan. There are also enormous deposits of lignite in North Dakota in the north-west. Petroleum wells are widespread, as in Ohio, Illinois and Indiana (where also there is or was much natural gas). But the most important oilfield lies within the States of Kansas, Oklahoma, Texas and Louisiana, this being the largest oil area within the States, that of southern California coming next.

Apart from Chicago some of the more important cities are St. Louis, at the Missouri-Mississippi confluence, with leather industries, iron foundries, etc.; Minneapolis and St. Paul, twin cities on either side of the Mississippi, at the limit of navigation, and just below the Falls of St. Anthony, the power of which is used for the flour-milling of Minneapolis; Kansas City, with meat-packing and related industries; the great port of Duluth, which in addition to shipping iron ore and wheat has important lumber industries. Detroit, with the Michigan or Northern Interior coalfield behind it, and access to the Lake Superior ore, is the seat of the Ford motor-car industry.

THE SOUTHERN AND SOUTH-EASTERN LOWLANDS. The essential feature of these is, of course, the great production of raw cotton, of which the States produce nearly three-fourths of the world's supply. The leading position in

regard to both maize and cotton, it may be noted, is associated with the fact that no other part of the globe seems to have so large an area of productive land in middle latitudes with a considerable summer rainfall, coinciding with high summer temperatures.

The northern limit of the cotton belt may be said to be the latitude of the town of Cairo, at the junction of the Ohio and the Mississippi. South of this, that is within the area where at least 200 days are frost-free, cotton is grown everywhere, to a greater or less extent, unless the soil or the local climate, as affected by relief, as in e.g. the southern Appalachians and large parts of the Ozark Mountains, makes this impossible. It is, however, excluded from practically the whole peninsula of Florida, showing only a slight penetration in the north. The western limit of the cotton belt is defined by the line where the mean annual rainfall is about 23 inches, and this restricts it to the State of Texas, New Mexico being too dry.

Within the cotton belt as thus defined there are four areas of maximum production. The most important of these is the Black Waxy Prairie region of Texas, centring round the towns of Austin and Dallas, the former lying some 200 miles from the port of Galveston. That port now exports more cotton than does New Orleans, and is also the outlet of the Texas oilfield. The second area of great production is that of the Mississippi Flood Plain, this belt extending from Memphis to Vicksburg on the river, and including parts of the States of Arkansas, Tennessee, Mississippi and Louisiana. New Orleans is the natural outlet of this area, where cotton forms almost the only crop. Further south, especially in southern Louisiana, sugar-cane and rice are grown, rice in the States being now largely produced in the Gulf area instead of as formerly on the coast of the Carolinas.

The two remaining major cotton areas occupy two concentric and crescentic belts extending from the

eastern border of the State of Mississippi through Alabama, Georgia and the Carolinas. The upper and inner belt corresponds largely to the Piedmont plateau (p. 315) on the Atlantic side, and to certain of the valleys of the southern Appalachians on the Gulf side. It is separated by a heavily timbered belt, characterised by infertile sandy soils, from the outer and lower belt, which corresponds to the inner part of the coastal plain. Beyond this again comes a second timbered belt before the swamps of the actual coast. The main ports of these areas are Mobile on the Gulf, exporting both cotton and timber products, and Savannah and Charleston on the Atlantic coast.

Throughout the whole of its extension the cotton plant is seriously menaced by the boll weevil, a small beetle which lays its eggs in the unopened boll or seed pod, and destroys it. The attacks have been particularly severe in the case of the valuable because long-stapled Sea Island cotton, formerly extensively grown on the islands off the coasts of the Carolinas and Georgia. The extension of cotton production in Texas also has been partly due to the fact that here, especially towards the northern and western limit of production, conditions are less favourable to the weevil than in the damper and warmer regions further east and south.

The South-eastern Lowlands in addition to cotton produce a large amount of timber and timber products (including turpentine and resin), especially from the valuable conifers of the evergreen forest (p. 289). Red cedar, used for the making of pencils, may be mentioned, while long-leaf pine is an important timber tree. Florida owes to its position a remarkably warm climate (but see p. 284). In the far south it produces bananas, pineapples and even some coconut palms. Oranges and grape fruit are produced in central and southern Florida. The peninsula is also rich in phosphates.

THE GREAT PLAINS AND MOUNTAIN BELT. These two

regions may be considered together as being of minor importance. Except at the eastern margin of the Great Plains agriculture without irrigation is impossible. There a certain amount of dry farming is carried on, with the use of drought-resistant types of plants. Extensive irrigation schemes are in progress in various parts, particularly in southern Arizona, where the waters of the Colorado and its tributary the Gila-Salt river are used. Irrigated long-stapled cotton is grown in the lower grounds of southern Arizona, as near Phoenix and Yuma, and in the adjacent parts of the extreme south of California, in the Imperial Valley, near the flooded area which forms Salton Lake. But the more usual irrigated crops are alfalfa, or lucerne, for fodder, sugar-beet, vegetables and fruits. Irrigated patches occur especially round the mining settlements, while Salt Lake City in Utah owes its irrigated and carefully-cultivated lands to the enterprise of the Mormons.

Apart from the limited areas in which irrigation can be carried on, the chief use to which the land can be put is that of pasture for stock. In the mountain belt the possibility of seasonal migration to higher and lower pastures is important, as it is always in mountain regions.

The main resource of the mountain belt lies, however, in its mineral wealth, especially the supplies of copper, silver, lead, and zinc, together with some gold, though much of this is worked out. Water-power is used for smelting purposes, and this makes irrigation water cheaper than it would otherwise be, as the same water can sometimes be used for both purposes. Copper is largely produced in Arizona and in Montana round Butte, which also yields all the other minerals named. Copper, it may be noted, also occurs in the United States much further east in the Keweenaw peninsula of Lake Superior (State of Michigan). Denver in Colorado is another great mining and smelting centre, while the State of Nevada yields much silver and the Sierras of California still produce gold.

THE PACIFIC COASTAL AREA (Fig. 44). The importance of this region lies in the presence of the Great Pacific Valley, bounded on the west by the Coast Ranges and on the east by the Cascades, with their continuation the Sierra Nevada. Within the valley lies much fertile land, highly productive when irrigated; but the significance of the region is greatly increased by the breaches in its western wall, which permit of the rise of great ports. A mountain knot in the region of the Klamath river divides the valley into a northern section lying within the States of Oregon and Washington, and a southern one included in California. The boundary between Oregon and California, in latitude 42° , marks the division line between the two sections.

In California the productive area is virtually limited to the valley, that is to the area west of the Sierra Nevada, but in the north conditions are more complicated. Here, to the east of the Cascades, enormous outflows of lava have formed a low-lying basin, traversed by the Columbia river and its great left-bank tributary, the Snake river. The Lower Columbia leaves this inner plain by means of a gap in the Cascades, and then crosses the Great Valley on its way to the Pacific, which it reaches through a gap in the Coast Ranges. The actual conditions are best understood by noting the course of the Columbia. It enters the State of Washington from British Columbia, flowing in a generally southerly direction, parallel to its tributary, the Okanagan. The Columbia then swings round at a right angle, and after uniting with the Okanagan flows south once more, and then, after receiving the Yakima on its right from the eastern Cascades, and the Snake on its left, the latter after a long course over the plateau, swings round once more to breach the Cascades, thus forming a great double bend. After piercing the Cascades it receives the Willamette from the southern section of the Great Valley and the Cowlitz from the north. The extreme northern part of the valley is,

however, sunk below sea-level, forming the inlet of Puget Sound. This has the ports of Seattle and Tacoma on its eastern side, while Portland stands at the head of ocean navigation on the Columbia before it turns north and pierces the Coast Ranges.

In the eastern part of the Columbia plains, as round Spokane, wheat can be grown without irrigation. Further west, in the Yakima valley, watering is necessary and the main crops are fruits, especially apples, with plums, cherries and some peaches. Dairying is also carried on with the aid of irrigated fodder crops. In the Great Valley irrigated orchards, especially of peaches and plums, occur, especially in the Willamette valley, while dairy-farming and small fruits largely replace these to the north. Seattle is particularly important as the port to which Alaskan produce comes ; some coal is found in the neighbourhood. Both the Coast Ranges and the Cascades are clothed with splendid forests, especially of Douglas fir, and this region ranks as the greatest timber-producing region of the United States, the South-eastern area (p. 333) coming second. Puget Sound and the Columbia river have very rich salmon fisheries.

In California the Great Valley is drained by the Sacramento, which flows south, and the San Joaquin, which flows north, the united streams entering San Francisco Bay, obviously a drowned estuary. The Golden Gate, or gap by which the original river broke through the most westerly of the Coast Ranges, is only a mile wide. The Californian valley has a length of about 400 miles, with a maximum width of 50 miles. In the extreme north a certain amount of cultivation can be carried on with the natural rainfall, but the amount of irrigated land steadily increases southward. While wheat used to be grown extensively, the tendency now is to concentrate on warm temperate fruits, especially those which can be dried, or tinned, or will stand export fresh to a fairly distant market (oranges). Oranges and lemons are grown, with



FIG. 44.—THE PACIFIC STATES.

The stippling indicates the chief valleys and lowlands in which cultivation can be carried on.

peaches, apricots, plums, grapes, figs, and so forth. Some rice is produced, and there is an intensive cultivation of vegetables. Dairy-farming is also carried on, and generally Californian agriculture is of a highly intensive and specialised type. There is abundant water-power from the Sierras, and though coal is absent the extensive petroleum fields of the southern part of the valley are of great importance. Pipe-lines run from the fields to the neighbourhood of San Francisco, to Monterey and to San Pedro, the port of the town of Los Angeles. There is a large export of Californian oil through the Panama Canal to Europe. The mountain belts are again well wooded. An important timber tree is the redwood, the only living species of *Sequoia* apart from the nearly extinct giant form (p. 290) of the Sierra Nevada; redwood is limited to the moist Coast Ranges.

Two thousands miles south-west of San Francisco lies the group of the Hawaiian Islands, which belongs to the United States. The population of some 260,000 contains a large majority of Japanese. The islands produce mainly sugar and pineapples.

ALASKA, with an area of over half a million square miles, has a population of not much over 50,000, though there is no doubt that the territory has vast resources. Among these may be mentioned its minerals, especially copper, gold and coal; its salmon fisheries; its timber, probably better fitted for paper-pulp than for lumber.

See books mentioned on page 293. Siegfried, *Les États-Unis d'Aujourd'hui*, Paris, 1927, translated as *America Comes of Age*, gives an interesting account of social conditions, with some useful maps.

CHAPTER XXI

MEXICO, CENTRAL AMERICA AND THE WEST INDIAN ISLANDS

STRUCTURE AND RELIEF. North America is connected to the southern continent by a continuous belt of land, interrupted only by the artificial cut of the Panama Canal in the extreme south-east. This belt, which is of varied and complicated structure, is made up of Mexico and Central America. In addition the chain of the West Indian islands, extending from Cuba in the north-west to Trinidad in the south-east, at once affords a link between the two continents, and delimits the Caribbean Sea. The region, islands and land-bridge alike, is characterised by a great development of volcanic activity. Some of the most striking volcanoes of the world occur in Mexico, and, with the series of active or recently extinct craters which fringes the Pacific coasts of Guatemala, Salvador and Nicaragua, form part of the "girdle of fire" which encircles the Pacific Ocean. Of the islands, also, the Lesser Antilles are volcanic, Mont Pelée on Martinique being specially noteworthy. With the frequency of volcanoes is associated, as in Japan, liability to earthquake shocks.

It is probable that Central America owes its present form to the union of formerly separate islands, which were joined by great outpourings of volcanic material. There are certainly a number of structural analogies between its elements and the West Indian islands. The marked contrasts between the wild animals of North and South America suggests also that the continuous land connection between the two is geologically recent.

One other general point is important. North and South America resemble one another in that both possess a lofty mountain belt in the west. The Cordillera belt of North America is continued into the peninsula of Mexico ; but although parts of Central America are hilly, the direction of the chains there seems to exclude the idea that the mountain belt of the northern continent is directly continuous with the Andes of South America.

Within the land-bridge political units show very little relation to structural features. The main Mexican peninsula is horn-shaped, the blunt and curved apex of the horn lying to the south-east in the narrowed region called the Isthmus of Tehuantepec. Putting the matter in another way, it may be said that, north of latitude 20° , the eastern or Gulf of Mexican coast has a north-to-south trend, while the western or Gulf of Californian coast trends from north-west to south-east, so that the peninsula narrows southward. South of latitude 20° both coasts show a marked eastward trend, thus the narrowing becomes more pronounced, reaching its maximum at the Isthmus.

Structurally this narrowing marks the limit of the Mexican peninsula, though politically Mexico extends much further east. It is, as just stated, a continuation of the Cordillera belt further north, and consists of two marginal mountain ranges, the Western and Eastern Sierra Madre, with an intervening plateau, which shows some resemblance to the Great Basin of the States. The plateau rises steadily southwards, from heights of 6,000 feet to over 8,000 feet. In the central region, in the depression called the Bolson of Mapimi, and towards the south, in that high part on which Mexico City stands, the drainage is interior, shallow lakes forming on the surface. Elsewhere the rivers are able to break through the marginal mountain walls, often in falls producing much water-power, and so reach the sea. Only on the wetter eastern side, however, is their

flow fairly constant. On this side there is a moderately wide coastal plain, which is a continuation of that of Texas. On the west, however, the Western Sierra Madre rises so abruptly as to leave but little room for a coastal plain. North of the tropic the main peninsula is separated by the narrow Gulf of California from the much narrower peninsula of Lower California. The Gulf appears to be a prolongation, drowned by sea-water, of the Great Valley of California described in the last chapter, while the peninsula seems to be a prolongation of the Californian Coast Ranges.

South of the latitude of Mexico City the Mexican plateau comes to an abrupt end, the margin, probably a fault-belt, being marked by a row of magnificent volcanic cones, rising, as in Orizaba and Popocatepetl, to heights of 18,000 feet and thus having a permanent snow-cover. South of this volcanic belt the surface sinks to a lowland, rising again further south in new mountain belts. These have, however, an east-to-west direction, like those of Central America. A comparatively narrow break in these chains occurs at the Isthmus of Tehuantepec, east of which the mountains are continued. It may be noted that although the Isthmus is now traversed by a railway, extending from the Gulf to the Pacific coast, the gap here did not play in Spanish times the part as a transverse route which the Panama isthmus did. This was due not only to its greater width, but to the difficulties of the crossing, owing to the swampy ground and dense vegetation.

Central America, as distinct from the Mexican peninsula, may be regarded as extending in a south-easterly direction from the Isthmus of Tehuantepec to the Isthmus of Panama or Darien. It falls into two distinct sections, separated by a narrowing of the land surface, resulting from the presence of lakes, particularly the large Lake Nicaragua. Of these sections the north-westerly is broader, and bears the almost rectangular peninsula of Yucatan, and the blunter one of Honduras. It is here that the struc-

tural similarities with the West Indian Islands are most marked. Thus the Yucatan peninsula shows a close resemblance, both in its rocks and its relief, to much of Cuba, from which it is separated by the Yucatan Channel, connecting the Gulf of Mexico with the Caribbean Sea. Cuba, in its turn, shows much resemblance to the peninsula of Florida, across the apex of which it lies.

While most of Cuba is low-lying, however, its southeasterly extremity, with Jamaica, Haiti and Porto Rico, contains mountains with a general east-to-west trend, quite similar to those of Guatemala and Honduras in Central America. The reappearance of the volcanoes of Central America in the Lesser Antilles has already been noted.

The second section of Central America, extending from the region of Lake Nicaragua to the southern continent, is narrow and sinuous. The actual Panama isthmus is built up of volcanic deposits, the mountain chains of the north-west being absent here.

MEXICO

This description enables us to realise the main features of the various political units. The republic of Mexico includes the main Mexican peninsula, and the state territories extend across the Isthmus of Tehuantepec to occupy the greater part of the peninsula of Yucatan. The arid and largely useless peninsula of Lower California is also Mexican. The total area is three-quarters of a million square miles, with a population of over 14 millions, very considerably greater, it will be noted, than that of Canada, which has nearly five times the area. Its composition presents some striking features, contrasting markedly with that of the southern United States. About $1\frac{1}{2}$ millions are of pure European descent, mainly Spanish. Some $8\frac{1}{2}$ millions are of mixed Indian and Spanish blood, and about 4 millions of pure Indian blood. The persistence of native Indians in large

numbers, the small white population, the vast number of persons of mixed blood and the general absence of negroes are the essential points.

The nature of the population results from a combination of geographical and historical causes. As the description of the plateau already given shows, it is difficult of access from all sides, though once developments had taken place to the north, in the United States, entrance has been easiest from this side, and American penetration is now taking place. The hot coastal lands are unsuited for European settlement, and the population is mainly concentrated on the higher and therefore cooler southern part of the plateau. So far as the Spaniards were concerned the first attraction was the mineral wealth, and this is still important. Owing to the nature of the surface the land is not well suited for large-scale cultivation, such as has transformed the cotton lands of the United States, and the native Indians have not been displaced by new types of land utilisation to anything like the same extent as in the States. Maize was the plant chiefly grown by the native population at the time of the Spanish conquest, and it is still that which is most widely spread, and forms the chief bread-plant.

On the hot lands near the coast tropical and sub-tropical plants, such as coffee, sugar-cane, vanilla, tobacco and so on, can be grown, while cotton is produced, mainly under irrigation, with other more temperate plants on the cooler plateau. But with the exception of sisal hemp Mexican agriculture is mainly for home use, not for export. This, a fibre obtained from an agave native to Mexico (cf. p. 256), is produced particularly in the north-west corner of the Yucatan peninsula, and is exported mainly to the United States from the port of Progreso. Since the fibre is used for making twine and sacking the demand in the States, which exports so much agricultural produce, is very large. So far as minerals are concerned, silver is still important, as it was at the time of the Spanish conquest, but gold,

copper and many others occur. Native mining and early Spanish mining was mainly carried on in the southern part of the plateau, but it is tending to spread north, especially in the western Sierra Madre, and there is some exploitation in the otherwise useless peninsula of Lower California.

Recently, that is within the last twenty years, the mineral resources have been enormously increased by the discovery of extensive oil-fields in the Gulf coastal plain, in continuation of the similar fields of Texas. There are two main areas, one behind the port of Tampico, which exports the product, and another further south, within reach of the port of Tuxpan. New fields are being developed in the Isthmus of Tehuantepec. As a petroleum-producer Mexico is now only second to the United States.

Mexico City (about 1,000,000) is much the largest town, while Vera Cruz, on the Gulf coast, is the chief port, taking most of the general trade of the country, as contrasted with the specialised exports of the ports already named.

THE CENTRAL AMERICAN REPUBLICS

There are six theoretically independent republics in the isthmian belt, these six being Guatemala, Salvador, Honduras, Nicaragua, Costa Rica and Panama. The last, formerly attached to Colombia, dates only from 1903, and is penetrated by the 10-mile wide Panama Canal zone, which belongs to the United States. A comparatively small area in the south-east of the Yucatan peninsula forms the colony of British Honduras. In the independent republics American influence is great and increasing. Coffee, of excellent quality, especially in Costa Rica, tropical fruits, especially bananas, and tobacco, are important products. The banana plantations have been mostly established with American capital, and negroes from the West Indian islands have been introduced to work them. British Honduras has a considerable export of tropical timbers,

especially mahogany and logwood. The tree which yields the rubber-like sap called chicle is abundant in the dense tropical forests, and is largely exported from Belize, the port of British Honduras, to the United States, where it forms the basis of chewing-gum.

The Panama Canal, opened in 1914, connects Colon or Aspinwall on the north coast with Balboa near Panama on the south coast. It passes through the artificial lake called Lake Gatun. Its successful construction was largely due to the elaborate precautions adopted to shield the workers from the tropical diseases which had proved so fatal at an earlier date. Campaigns against the mosquitoes which carry the germs of yellow fever and malaria (p. 253) were undertaken at vast cost but with great success.

THE WEST INDIAN ISLANDS

Politically the interesting point in regard to these islands is the steadily increasing influence of the United States. Porto Rico is practically an American possession, the Dominican Republic, which occupies the eastern part of the island of Haiti, has a United States military governor, while Haiti and the republic of Cuba are under American protection. The small Virgin Islands, east of Porto Rico, purchased from Denmark, were taken over by the States in 1917. The important point here is that St. Thomas, the principal island, has a good harbour on the direct route between the Panama Canal and Europe. Of the larger islands, Jamaica is British, as is Trinidad; most of the festoon of small islands also falls within British territory, save that Guadeloupe and Martinique are French.

Cuba is still thinly peopled, but the total population and the proportion of whites has increased greatly since the period of American protection. Havana, the capital, has now a population of over half a million. Cuba is the largest sugar-producing area in the world, the plantations

of sugar-cane having greatly increased of recent years. Tobacco, of very high quality, is also largely produced. A number of other crops are also grown, and there are forests, a well-developed pastoral industry and considerable mineral resources. Porto Rico produces mainly sugar and coffee. Haiti and the Dominican Republic, with a large negro element in the population, are somewhat backward, but yield sugar, coffee, cocoa and other tropical crops.

In Jamaica the production of fruit, especially bananas, oranges and coconuts is becoming increasingly important. The coral islands of the Bahamas have sponge fisheries, cultivate sisal hemp, and produce much fruit, especially pineapples. Much further north, about 600 miles from the coast of North Carolina, lies the Bermuda group, also of coral formation, and like the Bahamas a British colony. The islands form a favourite health and tourist resort for Americans and produce early vegetables and flowers for the American market.

The smaller islands yield the usual tropical products, such as fruits, especially pineapples, sugar, cocoa, spices and so forth. Trinidad, which, as is suggested by its shape, is a separated part of the South American continent, yields asphalt, obtained from a large lake in the interior, and also petroleum. Further westward, also off the coast of Venezuela, lies a small group of islands belonging to the Dutch, of which Curaçao is the most important. It grows a peculiar kind of orange, the peel of which is used in flavouring the liqueur of the same name. The fact is interesting because it illustrates the general tendency of the Dutch colonies to produce luxuries (cf. p. 70).

PART V
SOUTH AMERICA

CHAPTER XXII

GENERAL SURVEY OF SOUTH AMERICA

AREA AND POSITION. With an area of about seven million square miles, South America is considerably smaller than its northern neighbour, where the total reaches about eight millions. It shows also a marked contrast in position. Thus its westward limit is in longitude 81° west, which corresponds roughly to that of Toronto. Eastward again it extends to 35° west, which brings it some 20° east of Labrador. To the north it extends to $12\frac{1}{2}^{\circ}$ north, equivalent to the latitude of Gambia in Africa. Southwards in Cape Horn it reaches latitude 56° south, some 10° further south than New Zealand, and over 20° than South Africa. But the extreme tapering makes this southern extension of little importance, and by far the greater part of the continent lies within the inter-tropical zone.

STRUCTURE AND RELIEF. Structurally there is a certain broad resemblance to North America, though there is no equivalent to the Appalachian Highland, and the inner plains thus reach the eastern sea-board, most notably in the Amazon and La Plata estuaries. The Andes in the west correspond to the Cordillera of North America, though, as already seen (p. 340), they do not seem to be continuous with them. There is also a great eastern mass of ancient crystalline rocks, partly buried beneath unfolded sedimentary beds, which offers some resemblance to the Canadian Shield. This old crust block is traversed by the Lower Amazon, so that the Guiana Highlands to the north are separated from the Brazilian Highlands to

the south of the river. Finally, more than half the total area of the continent is covered by alluvial plains, which extend from the llanos of the Orinoco in the north, through the forest-clad Amazon basin to the pampas of the Argentine.

Fig. 45 gives a generalised representation of these structural elements. As regards the Andes, the change in direction of the coast-line, to the north of latitude 20° south, and in the neighbourhood of the town of Arica, should be noted, as it corresponds to a change in the character of the mountains. From this point northwards they form a great curve, convex seawards, which is continued along the northern coast of Venezuela, the mountains reappearing in the island of Trinidad (p. 346). Southwards, on the other hand, the Andes have an almost direct north-to-south direction, till in the extreme south, in Tierra del Fuego, they curve round to the east. The region where the change of direction takes place is one of great elevation, Sorata and Illimani being both over 21,000 feet, and is also that where the mountain belt attains its greatest width. It shows indeed a definite separation into an eastern and a western chain, with the high plateau of Bolivia between.

North-westwards from this region the mountains become lower and narrower, with great longitudinal valleys rather than a plateau between the chains. After curving to the north-west in latitude 5° south, and then to the north-east, lofty volcanic peaks reappear (Chimborazo, 20,500 feet, Cotopaxi, 19,600 feet), and still further to the north-east the belt splits up into a series of chains, bounding the extensive plains.

South of the latitude of Arica the plateau character is retained to about the tropic, and thereafter several parallel chains appear. The western chains follow the coast-line, and south of latitude 35° , after the culminating point has been reached in Aconcagua (22,800 feet), become progressively lower. The southern part of the



FIG. 45.—THE STRUCTURE OF SOUTH AMERICA.

1. The Andes, the dots indicating the chief volcanoes ; 2. Unfolded sedimentary rocks (ancient) ; 3. Crystalline rocks of Guiana and Brazilian Highlands ; 4. Alluvial plains ; 5. Tertiary tableland of Patagonia.

coast of Chile is fiord-like and broken, with many peninsulas and islands, containing prolongations of the outer chains. The eastern chains end much further north, but seem to have south-easterly prolongations extending towards the eastern coast between the La Plata estuary and Bahia Blanca.

The essential points as regards the plains are that the llanos of the north are, as it were, constricted between the Guiana Highland and the Andes, and the eastern prolongation of the great Amazon plains is similarly constricted between the Guiana and Brazilian Highlands. Further, the widening of the Andes in the latitude of Arica, with the westward extension of the Brazilian Highland there, means that the western part of the Amazon basin is connected by a narrow neck only with the Gran Chaco plain, which widens southward to the pampas. In the extreme south unfolded Tertiary rocks floor the tableland of Patagonia, which lies at a higher level than the plains proper.

The crystalline rocks which form the basis of the Guiana and Brazilian Highlands are exposed near the coast, especially in south-eastern Brazil. The plateau here rises to heights well over 8,000 feet, as it does also in the western part of the Guiana Highland.

DRAINAGE. Because of the build of the continent, and the aridity of much of the western coast, the great rivers flow to the Atlantic. Nearly 90 per cent. of the continent indeed drains to that ocean and most of the remainder either to the Pacific or the Caribbean Sea ; for it is a very striking contrast with Australia that the area without ocean outlet is small, well under 2 per cent. of the total. The chief region of internal drainage is the Bolivian plateau with the considerable lakes of Titicaca and Poopo, but there is also a region east of the Andes, in the tableland of Patagonia, where the rivers fail to find an outlet to the sea.

None of the rivers entering the Pacific reaches any size,



KAIETUR FALLS ON THE POTARO RIVER, A TRIBUTARY OF THE ESSEQUIBO,
BRITISH GUIANA

The falls are the result of the way in which the river descends from the Highland (Fig. 45) towards the coastal lowlands.

Photo by Major R. G. Kinsey.

and the Magdalena, the chief one flowing to the Caribbean Sea, is a minor stream. Into the Atlantic flow the Orinoco; the mighty Amazon, with its great tributaries the Ucayali, the Madeira and the Rio Negro; the Tocantins, draining a large part of the Brazilian tableland and entering the estuary of the Amazon; the São Francisco, which drains the eastern part of the tableland; finally the great estuary of La Plata receives the Uruguay and the Paraguay-Parana, the Paraguay draining the interior plains while the Parana carries off the waters of a large part of the southern section of the tableland. With the narrowing of the continent southward the Patagonian rivers are necessarily less important.

CLIMATE. The relief and our previous studies of the other continents makes it easy to draw general conclusions as to the climatic conditions. It is necessary also to bear in mind the tapering of the continent in south-temperate latitudes, and the enormous extent of ocean which surrounds this area, for both facts have considerable effect on temperature.

An outstanding feature is the small temperature range between summer and winter. This is, of course, to be expected in the wide equatorial belt (Fig. 46). But the points just mentioned, the southward tapering and the vast ocean, make it particularly marked in temperate latitudes, where there is nothing to correspond to the conditions seen in North America or temperate Asia (note the conditions at Bahia Blanca, Fig. 49). Another striking feature results from the enormous belt of elevated land, and the height which this attains. This is the moderate temperatures which prevail even in low latitudes in the Andes. Quito (Fig. 46) on the equator, but at a height of over 9,000 feet, has a temperature which varies very little from an average of 55° throughout the year, while Bogota, in about $4\frac{1}{2}^{\circ}$ north latitude, and at a slightly lower level, has mean monthly means of 57° to 58° throughout the year. South America indeed of all the

continents is that which has the largest areas with temperate or even arctic climate, within equatorial latitudes. A further striking point is the low temperatures in relation to latitude which prevail on the west coast from the equator southwards, this being associated with the cold Humboldt current which follows the coast from latitude 40° south northward to the equator. Another cold current flows south along the southern coast of Chile,

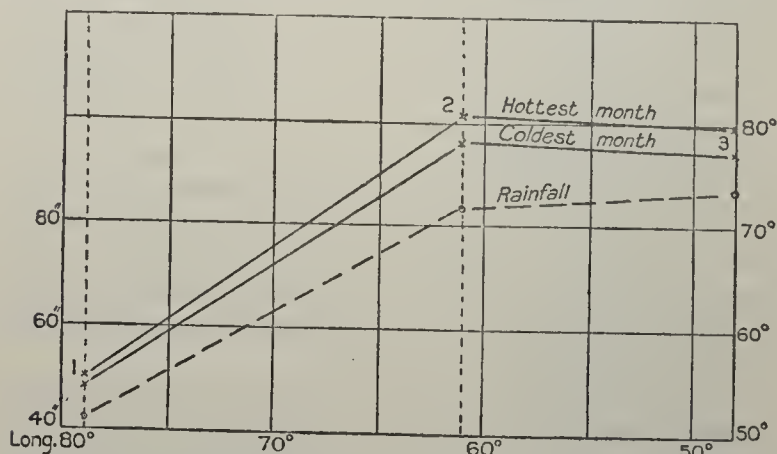


FIG. 46.—TEMPERATURE RANGE AND TOTAL RAINFALL IN EQUATORIAL SOUTH AMERICA.

1. Quito ; 2. Manaos ; 3. Para. Note the effects of the height of Quito on both temperatures and rainfall as compared with the lower stations.

though this branch is associated with less marked abnormalities of temperature than is the Humboldt current.

As regard rainfall, the northern part of the continent has typical tropical conditions, the north-east trades bringing heavy summer rain, followed by cool season drought. Thus Cartagena in Colombia has a total fall of 38 inches, but January and February are months of absolute drought. The direction of the Andean chain in Colombia permits these rains to penetrate into the inter-

vening valleys, and the west coast of Colombia, which is washed by a warm current, has also heavy rain throughout the year, the winds here being south-westerly and variable, and bringing much rain.

South of this tropical belt we come to the equatorial region, with heavy rain throughout the year, maxima marking the passage of the overhead sun (p. 228). The equatorial rainfall régime again gives place to the southern

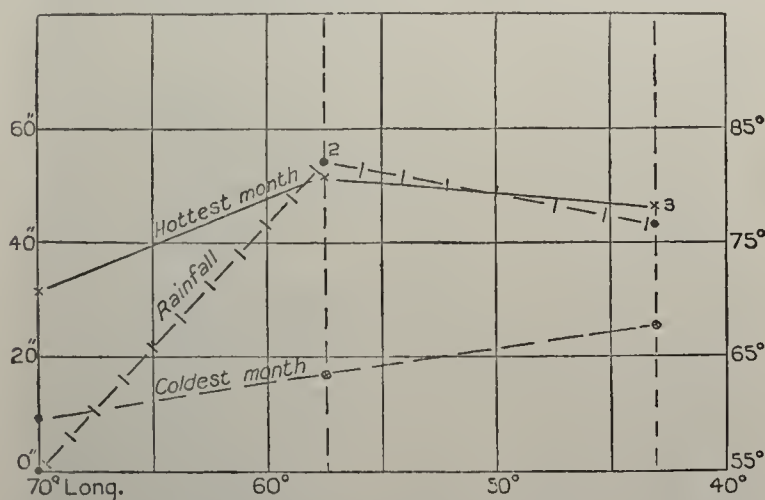


FIG. 47.—TEMPERATURE RANGE AND TOTAL RAINFALL AT STATIONS ON THE MARGIN OF THE TROPIC.

The left-hand station is Iquique, in the desert belt, with no rainfall, but a lower temperature range than Asuncion (2), which has a considerably heavier rainfall than Rio de Janeiro (3).

tropical type, but here there is a marked contrast between the east and west. On the west, from the Gulf of Guayaquil, a very few degrees south of the equator, southwards to about latitude 28° south, there is a narrow coastal strip at the foot of the Andes which is exceedingly dry and rapidly becomes pure desert (Fig. 47). As the diagram shows, the aridity is associated with remarkably low temperatures for the latitude. Rain along this desert strip is rare, though a fine mist or drizzle occurs

which helps to maintain a certain amount of vegetation, and at long intervals of time abnormal rainfalls occur.

In all this belt the Andes form a definite rainfall divide, for the eastern side of the continent shows the tropical type of rainfall, with a summer maximum, this extending

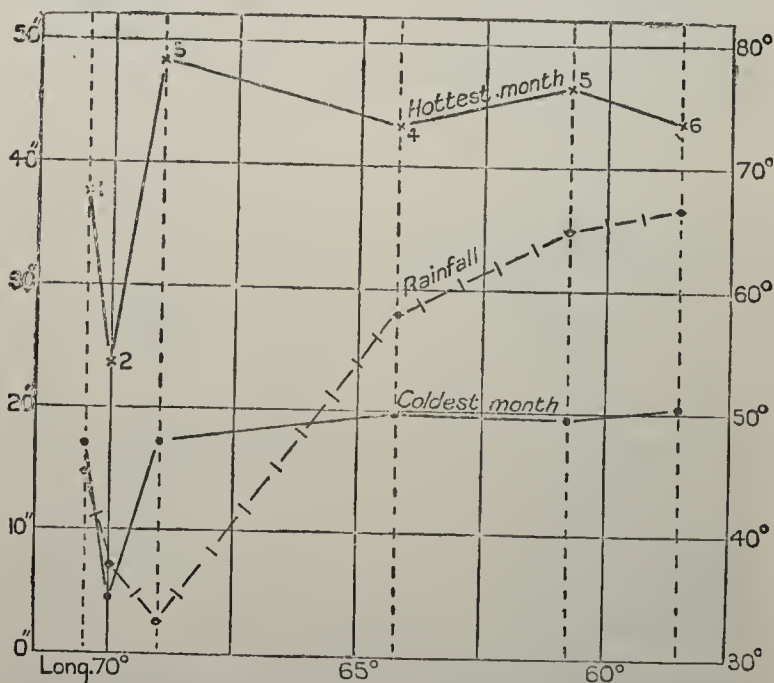


FIG. 48.—TEMPERATURE RANGE AND TOTAL RAINFALL IN WARM TEMPERATE LATITUDES.

1. Santiago in Chile ; 2. Uspallata Pass ; 3. San Juan ; 4. Cordoba ; 5. Rosario ; 6. Buenos Aires. Note particularly the low rainfall at the eastern basis of the Andes (San Juan) and the comparatively high summer temperature there.

well to the south of the actual tropic. North-eastern Brazil shows somewhat anomalous conditions, for in the interior of the States of Ceara, Piauhy and Pernambuco the rainfall is scanty, uncertain from year to year, and the summer maximum is not pronounced. The exact reason for this condition is not very clearly known.

TABLE IX

TEMPERATURE RANGE AND TOTAL RAINFALL AT DIFFERENT
LATITUDES IN S. AMERICA.

A. EQUATORIAL LATITUDES (0-5° S.). FIG. 46.

Station.	Position of station.	Height above sea-level. Feet.	Temperature range. ° F.	Total rainfall. Inches.
Quito.. ..	Andes	9,350	1	42
Manaos	Central	131	3	84
Para	E. coast	33	3	87

B. THE TROPICAL MARGIN (lats. 20°-25° S). FIG. 47.

Iquique	W. coast	30	11	0
Asuncion	Central	300	17	54
Rio de Janeiro	E. coast	216	11	43

C. WARM TEMPERATE LATITUDES (lats. 31°-35° S). FIG. 48.

Valparaiso	W. coast	135	11	22
Santiago	Valley of Chile	1,703	21	14
Uspallata Pass	Andes	9,335	19	7
San Juan	E. base of Andes	2,140	31	3
Cordoba	Central	1,437	23	28
Rosario	Eastern	95	27	35
Buenos Aires	E. coast	72	23	37

D. LATITUDE 40° S FIG. 49.

Valdivia	W. coast	49	14	105
Bahia Blanca	E. coast	49	25	21

On the west coast the aridity of the coastal strip gives place in about latitude 28° south to the Mediterranean type of climate, with winter rain and summer drought. This extends to about latitude 37° , and thereafter the south coast of Chile displays the western marginal type of climate in its most typical form. Valdivia (Fig. 49) shows a heavy total rainfall, with no dry season but a well-marked winter maximum, and remarkably moderate temperatures, both in summer and winter. In this part of the continent the Andes are not high enough or continuous enough to form a complete barrier to the winds. Since they descend with a foehn-like effect on the eastern side, however, there is here a rain shadow, forming the so-called Patagonian desert. Further east the rainfall increases, though still remaining small, so that Bahia Blanca (Fig. 49) on the east coast has only 21 inches as compared with 105 inches at Valdivia on the west.

The belt of small rainfall at the eastern base of the Andes is continued northwards, but the coast, as at Buenos Aires (37 inches) has copious rains, with a tendency to an autumn maximum. Fig. 48 illustrates the rainfall and temperature conditions experienced in travelling from the coast of Chile to the La Plata estuary. In the Argentine generally the important points are the rapid diminution of the total rainfall in passing from the coast to the interior, and the marked tendency for the amount of winter rain to diminish in the same direction, the rains in the interior being summer rains. The precipitation also shows great variability from year to year. These facts show the tendency of the climate to become "continental" as the coast is left and, as we shall see, have great influence on the crops and the use which can be made of the land.

DISTRIBUTION OF VEGETATION (Fig. 50). The distribution of vegetation types shows a broad correspondence to the climatic conditions, with as usual great variation in detail due to soil and local relief. Thus the arid west

coastal area from the Gulf of Guayaquil southwards is occupied by plants of the desert type, forming a very scanty cover. Since rainfall is also scanty at the eastern base of the Andes, from about latitude 30° southwards, a strip of vegetation of steppe type appears here, widening southwards, till it comes to occupy all the eastern side of Patagonia. These two belts of highly drought-resistant types, lying on either side of the Andes, may thus be said to form an oblique belt from the coast of Peru to the

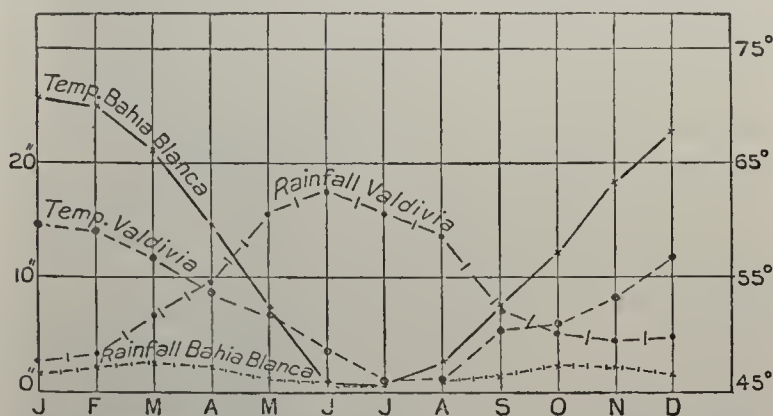


FIG. 49.—MEAN TEMPERATURE AND RAINFALL AT VALDIVIA AND BAHIA BLANCA.

Note the much heavier rainfall at Valdivia, and the small temperature range there.

Atlantic coast of Patagonia, marking the zone of greatest drought.

On the Pacific coast the desert belt passes gradually, in the part of Chile which has a Mediterranean type of climate, into a narrow belt of evergreen scrub-forest, resistant to summer drought. Still further south, with increased rainfall, this gives place to the temperate forest of southern Chile. This shows some striking contrasts to the temperate forest in similar latitudes in British Columbia. Owing to the force of the westerly winds, which in the "Roaring Forties" blow without obstruc-

tion over a vast ocean expanse, the trees tend to be stunted, and there is not the magnificent timber of the North American Pacific forest. The species of trees present are also entirely different. Stunted beeches occur, similar to those found in Tasmania and New Zealand, some species of these being evergreen—when they are called myrtles in Tasmania—while others are deciduous like our beech. The most conspicuous conifers also are Araucarias or monkey puzzles, not the more familiar pines and firs.

The High Andes have of course a mountain flora, similar in general type to mountain floras in other parts of the world. To the east of the Andes, north of about latitude 30° south, forests of varying degree of luxuriance occur, mingled with tropical savannas, that is areas where tall grasses, dry and withered in the dry season and tall and luxuriant in the wet, occur mingled with scattered trees, especially along water-courses. The forest attains its greatest luxuriance, becoming true rain-forest, in the Amazon basin, where there is no dry season. The heavy rainfall of the Pacific coasts of Colombia and Ecuador permits this dense forest also to appear there, and the Atlantic coast of Brazil shows, in the parts with heavy rainfall, a forest which is almost as luxuriant, though many of the characteristic Amazonian forms are absent. In the Highlands of Guiana and Brazil, especially in the areas where there is a well-marked dry season, this luxuriant, evergreen forest gives place to a more drought-resistant type, mingled with savannas. The llanos of the Orinoco should be noticed in particular as a region where trees are scanty, and grasses form the predominant plants. In the Gran Chaco region of the Argentine, again, though forest is present, it is a forest of special type, with many deciduous acacias, and passes gradually southwards into the true steppe zone at the base of the Andes.

On the Atlantic coast, in the extreme south of Brazil, in the Rio Grande do Sul, the luxuriant tropical forest gives place gradually to one of warm temperate type,



FIG. 50.—DISTRIBUTION OF VEGETATION IN SOUTH AMERICA.

1. Scrub forest (Mediterranean type) of Chile ; 2. Desert ; 3. Mountain flora ; 4. Drought-resistant tropical forest with intervening savannas ; 5. Equatorial rain-forest and forests of similar type on parts of the Atlantic coast of Brazil ; 6. Grasslands, including the pampas of Argentine and Uruguay ; 7. Steppes and steppe forest ; 8. The temperate forest of southern Chile.

(From *Hettner* slightly modified.)

which marks the transition to the pampas of Uruguay and the Argentine, which are grasslands of the temperate or prairie type.

PEOPLE. In the composition of the population, and the relation of the different elements, South America shows a much closer resemblance to Mexico and Central America than to the United States. The special features are the persistence of a large indigenous native population ; the number of half-breeds, particularly of persons of mixed Indian and European descent ; the fact that the European population is mainly of Mediterranean (Latin) descent or origin.

At the time of the Spanish Conquest the Indians inhabiting the high plateau of the Andes in Peru had attained a high standard of civilisation. They had succeeded in domesticating the llama and the alpaca, both derived from wild forms native to the High Andes. These animals are sheep-like in appearance, but are in reality more nearly allied to the camels of the Old World. The llama, much the larger of the two domesticated types, was—and is—extensively used as a transport animal, being as useful as is the yak to the Tibetans. It yields in addition milk and supplies wool, while the flesh is highly palatable. The smaller alpaca is chiefly valuable for its long and silky wool. The ancient Peruvians had also a considerable number of cultivated plants, including maize and potatoes, and were skilled in irrigation methods. Elsewhere the original Indian population had not made very great progress, fishing and hunting being the main occupations of the men, while the women carried on a certain amount of cultivation with the hoe as implement. There were no cattle, no sheep, no horses, no true pigs, all these having been introduced by Europeans (p. 239).

Though the Inca empire of Peru went down before the Spanish attack, the Indians were not exterminated, as they were so largely in the United States. On the high plateau of Peru and Bolivia Indian stocks, of pure blood and speak-

ing their own language, still form the majority of the population. This is also partly true of Paraguay. In the Andes of Colombia pure stocks again remain, but the Indians mainly speak Spanish. Elsewhere pure Indian stocks are chiefly limited to the remoter areas, as in the depths of the Amazonian forest and in the far south, and here have been scarcely touched by civilisation. But in Venezuela, many parts of Colombia and Ecuador, the coastal belt of Peru, and in parts of the Argentine, Chile and Brazil, half-breeds of mixed Indian and Latin blood are very numerous.

Till about a century ago the Europeans of the continent were almost exclusively of either Spanish or Portuguese descent, and the distribution of the two stocks is interesting. The Spaniards, after Columbus had shown the way, sailed westwards with the north-east trades and came back with the westerlies. Thus their ships were carried to the Caribbean Sea, and it was natural that they should cross the narrow isthmus of Panama, and so direct their attention to the mineralised belt of the western mountains. When difficulties arose between Spaniards and Portuguese about the division of the territories found by the great explorers, an appeal was made to the Pope Alexander VI, who fixed a line which granted to Portugal a triangle including the area which now forms the eastern section of Brazil, and to Spain the rest of the continent. The Portuguese explorer Cabral, in 1500, was carried accidentally by the south-east trades to Brazil, while on a journey which was intended to carry him round the south of Africa. Brazil, which became a state covering an enormous area, was thus Portuguese from the beginning, while the rest of South America was first colonised by Spaniards. So long as the attachment to Europe persisted the immigration of other European nationalities was prohibited. Once the former colonies became independent states, however, immigration became possible. Italians have emigrated largely to the

Argentine and parts of Brazil; there are considerable German settlements in southern Brazil and parts of Chile; but, broadly speaking, there are no very extensive vacant lands in South America in regions where the climate attracts European settlement.

With the development of tropical plantation products in the hot lowlands considerable numbers of negroes were introduced. The negro element is marked in parts of Brazil, in the Guianas, in Venezuela and in Colombia, while there has been a certain amount of Chinese emigration to the lowlands of Peru, and coolies from India have been introduced into Guiana.

POLITICAL UNITS. There are in South America ten independent republics, while a coastal strip between Venezuela and Brazil is divided into the three Guiana colonies, attached respectively to France, the Netherlands and Britain. A certain grouping of the independent republics according to the natural regions in which they lie is possible. The correspondence is not exact, but has some practical usefulness.

Of the ten republics no less than six may be grouped as Andean, these being, in order from north to south, Venezuela, Colombia, Ecuador, Peru, Bolivia and Chile. The inclusion of Venezuela in this group may at first sight appear strange; but it is justified by the fact that the best-peopled part of this somewhat backward state is the north-western portion which contains prolongations of the Andean chains. These six republics again fall into three groups:—(1) Venezuela, Colombia and Ecuador lie in the wet belt of the Andes, that is in the region of high rainfall; (2) Peru, Bolivia and the northern part of the much elongated state of Chile lie within the dry belt; (3) the centre of gravity of Chile falls within the belt of Mediterranean climate, and the republic may be said to differ from the more northerly states in its extension into temperate and cool temperate latitudes.

Some of the main contrasts between the groups may be

noted. In Venezuela, Colombia and Ecuador the population is fairly equally distributed between the hot, wet lowlands and the mountain areas. Within the latter crops of temperate climates can be cultivated without irrigation, but the agricultural products which enter into foreign trade are mainly derived from the hot belt.

In Peru, on the high plateau of Bolivia and in northern Chile cultivation can be carried on only on a small scale with the help of irrigation. The main centres of population, apart from the ports, are found on the cooler plateau, and the mineral deposits form the chief source of wealth. Livestock-rearing, as of llamas and sheep on the plateau, is the only other notable resource.

Chile as a whole is much richer in natural resources, for in addition to the mineral deposits, particularly the nitrates, of the arid area, a considerable amount of cultivation is possible at the lower levels in the wetter belt. In the south indeed, with increase in latitude, the elevated areas cease to be fitted for occupation, and the valleys and small coastal plains become important. Associated with this is the notable fact that whereas both in the tropical dry Andes of Bolivia and Peru and the tropical wet Andes of the north, state boundaries show little relation to the mountain crest, the state territories often extending well down into the eastern plains, the crest does for the most part form the boundary between Chile and the Argentine. The mountains, in other words, take on their usual function of "natural" division lines, separating the peopled areas at their base. They cannot play this part where they carry a considerable population, as they do north of the tropic.

Of the remaining political divisions the Guiana colonies, like Venezuela, extend into the Guiana Highlands, but their importance, where they have any, lies in the coastal strip where tropical products can be grown. The republic of Brazil is by far the largest single unit, politically speaking. Geographically it is not a unit. Its basis

lies in the original Portuguese settlements on the north-east coast. The plateau is thinly peopled, but there is a certain amount of stock-rearing and there has been some infiltration from the coast. In the south-east the state boundary corresponds broadly to the limits of the Highlands and its associated forest, leaving the grassland region to the north of the La Plata estuary to the small state of Uruguay.

The large state of the Argentine not only includes the temperate grasslands behind the La Plata estuary, but extends northwards into the forested Gran Chaco area, and southward into the steppes of Patagonia. Paraguay, which has an unsettled western frontier towards Bolivia, may be said to owe its existence as an independent state to a historical accident. The Spaniards found it exceedingly difficult to reach the silver mines of Upper Peru (the present Bolivia) from the Pacific. Their continued exploration of the Paraguay river, on which the foundation of the city of Asuncion was laid at the early date of 1535, had for its motive the desire to find an easier route to the mines of Potosi which proved enormously rich. The early settlements on the Paraguay were the nucleus of the present state, which contains a very small proportion of white men.

See Whitbeck, *Economic Geography of South America*, New York, 1926, with many references; *Amérique du Sud*, by P. Denis in *Géographie Universelle*, Tome XV, 2 vols., Paris, 1927; Jones, *Commerce of South America*, London, 1928; Shanahan, *South America*, London, 1927.

CHAPTER XXIII

THE STATES OF SOUTH AMERICA

THE three most important states of South America are the Argentine, Brazil and Chile, the A.B.C. states as they are sometimes called. They are so different from one another that they serve to illustrate the main features of the development of the continent, and the limits within which this has taken place.

THE ARGENTINE

This republic (Fig. 51) has an area of over 1 million square miles, with a population of over 10 millions (cf. Canada). An outstanding feature of the population is the great predominance of the European element, the virtual absence of negroes, and the comparatively small numbers of pure or half-breed Indians. The composition of the white population has been already mentioned (p. 363); it may be added that because of the trade relations there is a considerable British element.

The Argentine may be regarded as the most advanced of the South American republics, as is indicated by the relative density of the railway network, and the presence of the fine city of Buenos Aires, the capital, which has a population of well over $2\frac{1}{4}$ millions, and ranks as one of the great cities of the world. The exceedingly rapid growth and development of Buenos Aires, and of large parts of the state territories, are due to the large-scale production of commodities for which the demand in Europe is very great, and the consequent close economic relationship with Europe. These commodities are derived

from the cultivation of temperate crops, especially cereals, and from the livestock industry, both carried on mainly on the pampas or grasslands. But as a corrective to the not uncommon misconception that the pampas are co-extensive with the state territories, it may be added that forest products form the third great item in the list of exports, though they are of much less importance than the other two. Minerals play an insignificant part in the trade of the country, a very marked contrast with the Andean republics. There is practically no coal, but a small amount of petroleum is produced in Patagonia.

Four major natural regions can be recognised:—the pampas, the level and fertile grassland area responsible for most of the country's exports; the forested region to the north, including part of the Gran Chaco; the arid and semi-arid area to the west, including the slopes up to the Andean crest; the arid and windy plateau region of Patagonia. The pampas include the large and fruitful province of Buenos Aires, and parts of those of Entre Rios ("between the rivers," that is the Parana and Uruguay), Santa Fé, Cordoba, and of La Pampa territory. The most important crops, apart from alfalfa, are, in order of importance, wheat (about 19 million acres), maize (about 10 million acres), flax for seed (about 7 million acres) and oats. The enormous area under wheat and the large one under maize are characteristic, and the distribution of these crops is interesting.

The zone of intensive wheat production forms a crescent which may be said to begin in the south of the province of Santa Fé, extends into south-eastern Cordoba and the eastern section of La Pampa, finally passing through the western part of Buenos Aires province to reach the part of the sea-coast extending eastward from the port of Bahia Blanca. The northern part of the belt is within reach of Rosario, the river port on the Parana, 400 miles from the ocean. The southern section lies close to the port of Bahia Blanca, while the intervening section is

within reach of Buenos Aires owing to the network of railways.

Maize, requiring at once more heat and more moisture than wheat, is widely spread in the Argentine, but the area of maximum production forms a roughly circular patch within the wheat crescent, but lying towards its

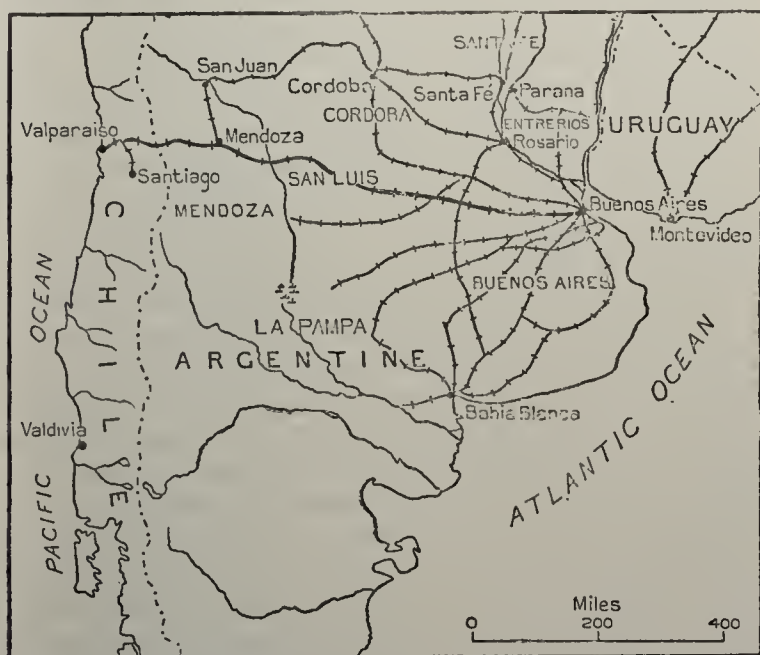


FIG. 51.—THE PROVINCES AND RAILWAYS OF THE CENTRAL ARGENTINE, WITH THE TRANSCONTINENTAL RAILWAY.

northern part. The southern part of the province of Santa Fé is particularly important, but the crop extends into Córdoba and the northern part of Buenos Aires. The greater part of the maize area is within the zone which sends its exports to Rosario, the remainder is within reach of Buenos Aires. As a marked contrast to the United States it is to be noted that maize in the Argentine is little used for stock-rearing, and is very

largely exported. Flax is grown for seed, chiefly in southern Santa Fé.

Cattle-rearing was the original use to which the grass-lands were put, and Argentine contains about 37 million head of cattle, reared especially in the province of Buenos Aires. The cattle industry has, however, undergone great changes with the cultivation of alfalfa or lucerne as fodder, this plant covering now a greater acreage than wheat. Alfalfa increases greatly the capacity of the land to carry cattle as compared with the natural grasses, and also hastens the growth of young animals to market size. Its cultivation has led also to the development of a dairying industry in the country, with a considerable export of butter and cheese. Chilled and frozen beef, with meat extracts, are, however, much more important.

With the spread of cereal production and of the cultivation of alfalfa sheep are losing some of their early importance. Their number is now less (about 30 millions) than that of cattle. Though the majority of the sheep are still found in the province of Buenos Aires, there is a tendency for them to be displaced towards Patagonia, mostly little fitted for anything else, and towards the arid west.

Of the forested area the most important product is quebracho, a tree which yields an extract rich in tannin and therefore of great importance in the tanning industry. The tree grows especially along the Parana river, particularly in the northern part of the province of Santa Fé and in the southern part of the territory of Chaco; the woods extend also into Paraguay. In the extreme north-east, in the Misiones territory, maté is grown, as it is in Paraguay and southern Brazil, and the valuable timber tree called Brazilian pine, really an *Araucaria*, occurs. Maté, or Paraguay tea, is the dried and powdered leaves of a shrub allied to our holly, which grows wild in the forests, but is also cultivated. It is very extensively used in South America as a beverage, but has little market outside the country. Forestry operations are carried on to some

extent in the western part of the Chaco territory, It is believed that large areas here will prove suitable for cotton cultivation; a good deal of land has already been put down to the crop.

The main interest of the arid region near the base of the Andes lies in the possibility of growing warm-temperate or tropical crops by means of irrigation. Two regions are of interest. Near the city of Mendoza the mountain streams irrigate extensive vineyards, and this, with San Juan (Fig. 48), is the wine-producing region of Argentine. Further north, near Tucuman, other irrigated lands are devoted to sugar-cane, Argentine normally producing enough sugar for her own needs.

As already stated the building of railways has made much progress in the Argentine, especially in the pampas. There is one transcontinental line, the only one in South America, connecting Buenos Aires with Santiago and Valparaiso in Chile. This crosses the Andes at the Uspallata pass, the highest point of the line being 10,452 feet above sea-level, and the summit tunnel 2 miles in length. The railway is difficult to keep open in winter and carries little through goods traffic. The great importance of the inland waterway of the Parana-Paraguay should be noted, and the length of the La Plata estuary, which penetrates for a distance of 195 miles into the interior.

URUGUAY AND PARAGUAY

As one would expect from their position, these two small republics resemble the contiguous parts of the Argentine. Uruguay resembles the province of Buenos Aires in character, but the recent Argentine development of cereal and alfalfa production is scarcely represented here, and the country is almost entirely a stock-raising one, the flocks being dependent on the natural pastures, which are rich. Sheep are more numerous than cattle and wool is largely exported. The

value of meat and meat extracts, however, exceeds that of wool. Meat is exported frozen, chilled, tinned and as meat extract. Montevideo, the capital, a fine modern city, with over 400,000 inhabitants, contains a quarter of the population. The towns of Fray Bentos and Paysandu, on the Uruguay river, are important for their meat-packing establishments, in which English capital is largely invested. As in the Argentine, the population is mainly of European descent.

Paraguay, with its mainly Indian population, is backward and little developed. Among its agricultural products are included especially tobacco, with oranges and maté. There are many cattle, but they produce poor beef. Hides and skins are largely exported, as well as quebracho and some timber.

BRAZIL

With an area of over $3\frac{1}{4}$ million square miles Brazil surpasses in size the United States, and has a population of 39 millions. More than half the population of the continent (about 75 millions) is concentrated here, though the fact is less important than it seems, for a very large, though unknown, proportion consists of negroes of a very unprogressive type, of mulattoes and of Indians. Further, some 90 per cent. of the population is concentrated in the eastern part of the plateau and on the eastern coast, leaving vast areas practically unoccupied save for uncivilised Indians.

In the relatively well-peopled area of the east three contrasted regions can be recognised. The central and most important is that near the tropic, with the important port and capital of Rio de Janeiro (over 1 million), the town of São Paulo (600,000), on the plateau, and its port, Santos. In this part of Brazil the plateau edge rises steeply from the coast, and the basaltic soils and the climatic conditions are peculiarly suited to coffee, the leading product of the region, as it is also the leading

export of Brazil, which produces 60 to 65 per cent. of the world supply. From this region southwards the white element in the population predominates. Santos is now the main coffee port, being connected by rail with the city of São Paulo, from which lines radiate to the actual regions of production. In addition to coffee this part of Brazil produces also cotton, sugar, maize and rice, while the inland state of Minas Geraes ("General Mines") is the chief mineralised area of the country. Gold and diamonds are not now of great importance, but manganese is largely worked and exported, and there are enormous deposits of rich iron-ore, as yet little used because of the difficulty of access and the absence of fuel.

The coffee region of São Paulo is just on the margin of the tropic. Considerably further south lies a group of states, of which the most important is Rio Grande do Sul, where the climate is warm-temperate and well suited to European occupation. Here German and other settlers are developing the country with some rapidity. A great variety of plants can be cultivated, including cereals, especially maize, rice and some wheat; tobacco; fruit, especially grapes; and maté, while the forests produce much Brazilian pine. Livestock-rearing is also extensively carried on, sheep, cattle and pigs being reared, the last fed largely on maize. The ports of this region, such as Porto Alegre and Rio Grande, are not very good on account of the lagoon coast.

The third area with considerable agricultural developments is the northern one, centring round the coastal plain, which is well developed between the ports of Bahia (San Salvador) and Pernambuco (Recife). This area is definitely tropical, and the population has a very large negro element and carries on cultivation by slack and slovenly methods. The characteristic crops are sugar-cane, cocoa, tobacco and cotton. The production of cacao beans for cocoa is interesting, because Brazil is now second to the Gold Coast (p. 256) as a world producer,

Ecuador having lost its original predominance. The beans are exported mainly from Bahia to the United States. For sugar-cane cultivation Brazil is well suited, but stands comparatively low in the list of producing areas, being greatly surpassed by the islands of Cuba and Java. Pernambuco is the chief sugar port, though Rio de Janeiro also exports sugar from the plantations near it. Tobacco is very extensively grown in the state of Bahia, and Brazil ranks second, after the United States, as a producer of tobacco.

The interior of the tableland is but thinly peopled and undeveloped, though some cattle-rearing is carried on. The only other region of any importance is the Amazon Basin, with its vast selvas or equatorial forests, and its wonderful system of waterways. The river is navigable for ocean-going ships to Iquitos in Peru, a distance of 2,300 miles. Manaus, formerly an important Brazilian rubber port, is some 1,000 miles up the river at its junction with the Rio Negro, while Para (Belem) on the estuary is the outer port. The forest yields a considerable variety of products, such as cabinet woods, including mahogany, ebony and rosewood; dyewoods, such as logwood; Brazil nuts, and so on, while there is a certain, if not large production of tropical crops such as cocoa, sugar and manioc in the Lower Amazon area. But the great interest of the region lies in the rise and decline of the rubber industry. Rubber trees of the *Hevea* type, yielding excellent rubber, occur wild throughout the forest, being, however, everywhere scattered. Rubber was exported from Brazil so early as 1825, but it was not till the great development of the motor car industry that the exports became of great importance. From about 1900 the expansion was extremely rapid, wild rubber being collected over a wider and wider area, and the native collectors treated with great cruelty. High-water mark was reached in 1912, when the competition of plantation rubber from the Malay region, Ceylon and the Dutch

East Indies was already beginning to be felt. Thereafter the collapse of the Brazilian industry was rapid, and the wild rubber of the Amazon region, despite its high quality, is now of little importance in the world market. Some attempts have been made to start rubber plantations in Brazil, but without notable success.

THE GUIANA COLONIES

These are of little importance and have a very small white population. British Guiana is the most productive of the three, while French Guiana is used in part as a penal settlement. Sugar is the chief crop, being grown on the dyked lands of the coastal lowlands. Gold is still produced on a small scale, and British Guiana yields diamonds. The forests produce some rubber and gutta-percha.

CHILE

This curiously elongated state has a total area of nearly 300,000 square miles and a population of about 4 millions. It extends from latitude 18° to latitude 56° , so that climatic conditions vary greatly in the different parts, but has an average width not greatly exceeding 100 miles. There are three distinct regions. The Central Valley, including but 600 miles of the total length of 2,600 miles, forms the real heart of the country. To the north lies the desert strip, extremely important because of its production of nitrates and copper, but of no value otherwise. Southwards is the wet and stormy strip exposed to constant westerly winds, with forests of moderate value as timber, and, especially towards the far south, a sheep-rearing industry of growing importance. This is the Chilean equivalent of the similar industry of the extreme south of the Argentine (p. 370), for the frontier here is the result of a compromise, and does not correspond to a limit between different natural regions.

The Central Valley, which lies between the main chain

of the Andes and the coastal range, and is traversed by a number of small streams, contains the capital, Santiago, connected by rail to Valparaiso, the most important port of the Pacific coast of South America. The valley, with its Mediterranean climate and its possibilities of irrigation (cf. the Great Valley of California), is the main agricultural area of Chile. Wheat is grown extensively, both with and without irrigation, but mainly for home use, exports being comparatively small in most years. The vine is cultivated largely for wine-making, and Chilean wines have a considerable reputation. The production of fruit is also important, but the comparatively low temperatures (p. 354) lead to attention being paid to grapes, apples, plums, peaches and small fruits rather than to the more delicate types like oranges. Cattle are reared, though not on a very large scale, and there is little dairying, Chile being largely dependent on Argentina both for beef and dairy produce. Generally the valley may be said to show characteristic Mediterranean features, but it exports little, the agricultural products being mainly absorbed at home.

It is this fact which makes the nitrates of the arid area so supremely important to Chile, as they, with copper, constitute the main exports, that is form practically all that Chile has to bring into the world market.

Chile's virtual monopoly of the nitrate deposits of the Atacama desert dates only from the war of 1879-1883, as a result of which she deprived Bolivia of the whole of its small coast-line and took also a part of the coastal strip from Peru. The nitrates lie in beds on the surface at heights varying from 4,000-9,000 feet above sea-level, in a region of extreme aridity between the coast range and the main Andean chain. They extend from latitude 19° to latitude 27°. The rock surface is broken up by explosives, the nitrate-bearing pieces taken to factories on the spot, and the soluble salt removed by treating with hot water and then crystallised by evaporation. Petroleum is now

largely imported from California (p. 338) as fuel for the process of extraction, for though Chile contains small deposits of coal near Concepcion in the south, the quality is poor and transport is difficult. There are several ports on the desert coast, none very good, but all connected by rail with the nitrate fields. Iquique and Antofagasta may be mentioned in particular. Much of the nitrate goes to the United States to be used as a fertiliser; Germany used to be a large importer because of her large tracts of poor lands, but is now manufacturing nitrate by synthetic methods. Copper is mined extensively in the region behind the port of Antofagasta.

BOLIVIA AND PERU

These resemble Chile in so far as minerals form an important part of the resources. In the case of Bolivia, indeed, the exports are almost entirely derived from the mines. It is second to the Straits Settlements as a producer of tin, and produces nearly one-quarter of the world supply. Silver and copper are also obtained. La Paz, the capital, is connected to the Chilean port of Arica by a railway following a very difficult route. Peru has a larger population and more varied resources. Off the dry coastal belt are islands containing deposits of guano, now mainly used within the country. The lowland itself under irrigation produces cotton and sugar, with some rice, the sugar and cotton being largely exported. The coastal belt also yields petroleum, but the chief minerals are found in the mountain belt, and include gold, silver, copper and others. The fact that the country extends in eastern Peru into the Amazon basin means that rubber is produced, now on a small scale. The coca shrub, yielding an important drug, used in medicine, grows wild and is also cultivated. The Indians habitually chew the leaves, which render them tolerant of hunger, fatigue and cold, but have a stupefying effect. The main exports of Peru are sugar, petroleum, copper and cotton. The capital,

Lima, on the coastal strip, has a population of over 200,000, and is a few miles from its port, Callao.

ECUADOR, COLOMBIA AND VENEZUELA

These three republics have a comparatively small white population. The exports of Colombia and Venezuela consist mainly of coffee, of Ecuador mainly of cocoa (cacao beans). Colombia also produces and exports a good deal of gold, being the leading South American state in this respect, and contains emeralds and platinum. In Venezuela petroleum wells round the shallow lake or lagoon of Maracaibo have been exploited recently to a considerable extent, and great hopes are entertained of the field, though the lake is so shallow that it is difficult for oil-tankers to enter. It has been suggested that the llanos of the Orinoco, shared between Colombia and Venezuela, will in the future become a cattle-rearing area of world importance, but so far there is little evidence of this, the land being largely flooded in the wet season and the grass withered in the dry one.

An interesting natural product, now of very minor importance, is "Peruvian bark," obtained from the different kinds of *Cinchona* trees, quinine being an extract of this bark. *Cinchona* trees grow on the wet eastern slopes of the Andes, from about 7° north to 22° south, so that they occur within the states of Colombia, Ecuador, Peru and Bolivia. Till about 1880 the forests of south-eastern Colombia supplied most of the bark of commerce, but the introduction of the tree into India (p. 184), Ceylon, and particularly into Java and Sumatra, has reduced the collection of the bark of wild trees to insignificance. It should be noted that, as is the case with rubber, the *Cinchona* trees occur scattered through the dense forest, so that collection is a matter of great difficulty, while this difficulty does not occur in plantations.

A minor industry of some interest in Ecuador is the making of the so-called Panama hats. It is an Indian

industry, the material used being very fine fibre obtained from the leaves of a palm. The hats command a high price in New York, but the actual workers are poorly paid.

THE FALKLAND ISLANDS form a British colony, and are situated to the east of the Strait of Magellan. The climate is damp and foggy and sheep-rearing is the chief occupation.

PART VI
AUSTRALASIA

CHAPTER XXIV

AUSTRALIA, NEW ZEALAND AND THE AUSTRALASIAN ISLANDS

AUSTRALIA

THIS island continent, with Tasmania, has an area (2,975,000 square miles) almost precisely the same as that of the continental United States, though the total population is little over 6 millions. It extends from latitude 11° to 39° south, or if Tasmania be included to latitude 44° , in its more elongated eastern section, and from latitude 15° to 35° in the west. Its easterly coast thus corresponds to that of South America from the south of Pernambuco to Bahia Blanca, which has a latitude similar to that of Melbourne. Its western coast may be said to correspond to that of South America from a degree or two south of Lima in Peru to a little south of Valparaiso in Chile, but has a very different trend, the north-to-south section being short, while there is a marked western bulge in the region of the tropic which has a considerable effect on the climate.

In structure, particularly in regard to the great extension of plateau areas, there is not a little resemblance to South Africa. From the economic aspect, on the other hand, there is a considerable resemblance to the Argentine in South America, with some striking differences. Thus Australia reaches $2\frac{1}{2}$ times the size of the Argentine, but has less than two-thirds of the population. In both livestock-rearing is important, and wheat forms the chief agricultural crop. But though Australia contains more than three times as many sheep as the Argentine, its cattle number

little more than a third of those of the better-watered country, and, despite the much greater size, its wheat-fields, extending over about 14 million acres, are much less extensive than those of the Argentine. With these facts may be associated the further one that the greater part of the interior of the Australian continent, amounting to nearly two-thirds of the total area, is devoid of rivers draining to the sea, and forms a vast basin of internal drainage. A wealth of minerals is present to which the Argentine offers no parallel, but although half the continent lies north of the Tropic of Capricorn, tropical products are of no great importance, and, as contrasted with the Argentine, maize occupies a very small acreage.

This comparison enables us to deduce some of the essential features of the Commonwealth. On account of the aridity which prevails over a large part of the surface sheep-rearing for wool is the most important occupation; the plateau structure is associated with a notable development of minerals, including gold; the suitability of certain areas for wheat has led to the rise of a considerable export trade in this commodity.

STRUCTURE AND RELIEF. In build the continent shows much simplicity. Young folded mountain chains are absent, as they are in Africa south of the Sahara, but such chains reappear across the ocean to the south-east in New Zealand, and to the north-east in New Guinea. The whole of the western part of the continent consists of an ancient crust-block, comparable to the Brazilian Highland in South America. In the south-west this is broken off sharply near the coast, forming the Stirling Range to the north of the town of Albany, and the Darling Range behind Perth.

From these coastal scarps the surface of the tableland extends endlessly and monotonously northward and eastward, becoming desert in the interior. The tableland reaches an average height of 1,200 feet, but drops to considerably lower levels in the region north of the Great

Australian Bight. This is margined by coastal cliffs 200 feet high, behind which extend the Nullarbor Plains. These are floored by porous limestones, so that surface water is practically absent, and settlement becomes impossible. Considerable coastal plains occur also in the north-west, in Dampier Land, and in the north, in Arnhem Land. In the centre, near the eastern edge of this western plateau, the surface rises to heights exceeding 4,000 feet in the Macdonnell Range, with the Musgrave Range to the south.

The second important relief element is the great belt of lowland which stretches from the Gulf of Carpentaria in the north to the south coast between the mouth of the Murray river and the western end of the Victorian Highlands. Structurally, however, the plains fall into two parts. The northern section, representing, it would seem, an old arm of the sea, ends in the depressed basin of Lake Eyre, 39 feet below sea-level. The southern section is formed by the plains of the Murray-Darling system. The two are partially separated by prolongations of the South Australian Highlands. The western prolongation forms the Flinders Range, which extends north of Spencer's Gulf. This is an area of depression flooded by the sea, the Gulf being connected by a chain of swamps and lagoons with a low-lying region in the interior containing Lakes Torrens, Gairdner and others. The eastern prolongation of the Highlands forms the so-called Barrier Range, with the important mining centre of Broken Hill on its eastern edge, continued into the Grey Ranges.

The third great structural element is the Eastern Highlands, often called the Dividing Range, which extend from Cape York to the extreme south, and then bend westwards as the Highlands of Victoria. Across Bass Strait the Highlands reappear in the island of Tasmania. These Eastern Highlands, which are comparable to the Drakenberg in South Africa, have undergone recent uplift, and show a much more varied topography than the searps of the western tableland. They nowhere reach any great

height, Mount Koseiusko, the highest point, rising little above 7,000 feet, but are of great human importance. Owing to the barrier which they present to the rain-bearing winds, the rainfall, high on the narrow coastal plains, diminishes rapidly to the west of the crest. They rise steeply from the coastal plain, and presented similarly a great barrier in early days to penetration into the interior plains. In the railway era, also, they formed an obstacle difficult to surmount, particularly in the region behind Sydney.

A comparison with the Appalachian Highland in the United States naturally suggests itself, and some of the outstanding contrasts should be noted. Sydney is in about the same latitude as Wilmington in North Carolina, and the much greater narrowness of the coastal plain is obvious. The eastern coastal plain of Australia is only of moderate fertility, and the difficulty of building railways through the Blue Mountains, as the part of the Highlands behind Sydney is called, and through the Australian Alps further south, is so great that there is no direct connection between the coast and the interior plains between the two great railway centres of Sydney and Melbourne, a fact which concentrates traffic on these two ports.

RIVERS AND WATER SUPPLY. The Eastern Highlands feed a considerable number of rivers flowing eastwards to the sea, often, particularly in the Blue Mountains, occupying deep gorges. The rivers are, however, for the most part short. The western slopes of the Highlands give rise to much longer streams. Of these the Mitchell and Flinders flow into the Gulf of Carpentaria. The Diamantina and Cooper's Creek flow, at least at times, into Lake Eyre, but like most of the other streams of the interior their flow is irregular and uncertain. The only really important river is the Murray, which results from the union of the three trunk streams of the Darling, the Murrumbidgee, with its large tributary the Lachlan, and the Upper Murray or Hume. The Murray



HARVESTING WHEAT IN WESTERN AUSTRALIA

The Combined Harvester used strips the ears, leaving the straw standing (seen to right), threshes the grain, and puts it into bags; very little man labour is thus required. Contrast Plate XIII. The trees are eucalyptus.



IRRIGATION CHANNEL AT LEETON, NEAR YANCO, N.S.W., IN THE MURRUMBIDGEE IRRIGATION AREA

Photos supplied by Commonwealth Immigration Office.

flows westward till it is forced to turn sharply south by the South Australian Highlands, and enters the ocean by the shallow inlet called Lake Alexandrina, lying south-east of the Gulf of St. Vincent. A bar across the mouth of the lake prevents ships entering the river from the sea, so that Adelaide is placed on the eastern shore of the St. Vincent Gulf, and not near the Murray mouth.

The Murray flows throughout the year, but the Darling often dries up in places into a chain of pools. The absence of a sea-outlet greatly reduces the value of the streams as waterways, but they are navigable for long stretches, at least at times. Thus the Murray can be ascended to Albury, on the frontier between Victoria and New South Wales, an important junction on the railway between Melbourne and Sydney. The Murrumbidgee, which flows parallel to the Upper Murray, can be navigated to a point slightly further east, while at times the Darling is navigable up to and beyond Bourke, a town also connected by rail to Sydney. This represents about 1,000 miles of navigation from its junction with the Murray.

Much more important than their value as waterways, however, is the value of these rivers for irrigation purposes. Almost all the irrigated areas in Australia are fed by water from the Murray-Darling system. Mention may be made of the huge Burrinjuck dam, on the Upper Murrumbidgee where it emerges from the hills, which supplies water for an extensive fruit-growing industry. In the north-western lowlands of Victoria the Murray and some of its smaller tributaries, such as the Loddon and Goulburn, supply water for somewhat extensive irrigation schemes, as at Mildura and Echuca, both on the Murray, the latter watered from the Goulburn. The irrigated land is again mainly used for the production of fruit, which is canned, or dried (raisins, currants, sultanias), or the grapes used for wine-making.

The other rivers of Australia are of little importance and uncertain flow in most cases, but the presence of

apparently very large supplies of subterranean water, which can be tapped by artesian bores, must be noted. What is called the Great Australian Artesian Basin (Fig. 52) includes a large part of the state of Queensland west of the Highland, a strip of New South Wales along the northern border of the state, also west of the Highland, the south-eastern corner of the Northern Territory, and a large area in north-eastern South Australia, round the Lake Eyre region. Within the limits of this Basin the putting down of bores is either followed by a flow of water at the surface, as a result of the pressure under which it is lying, or, less frequently, the water has to be brought to the surface by pumping, the hydraulic pressure being insufficient to cause a surface flow. In addition to this Great Basin, another occurs round the Lower Murray, and several have been surveyed in Western Australia. Artesian water in Australia is apt to be saline, and is thus generally unsuitable for watering lands devoted to agricultural crops ; but as a rule it can be used for stock. Thus the numerous artesian wells are particularly important as a means of keeping open stock routes through arid areas, and they have also done much to diminish the fearful losses of sheep which used to occur in years of exceptional drought. The wells also increase the area which can carry sheep.

CLIMATE. We should expect the climatic conditions of Australia to show general resemblances to those prevailing in the two other continents which extend south of the equator. If this expectation is in part fulfilled, certain peculiarities of form which exert a marked influence on climate have to be noted. The first is the great breadth of the Australian continent, which reaches its maximum in the region of the southern tropic, where South America is already beginning to show a notable narrowing. The west coast of Australia also shows, as already pointed out, a remarkable convexity in the vicinity of the tropic. With this is apparently associated the fact that the

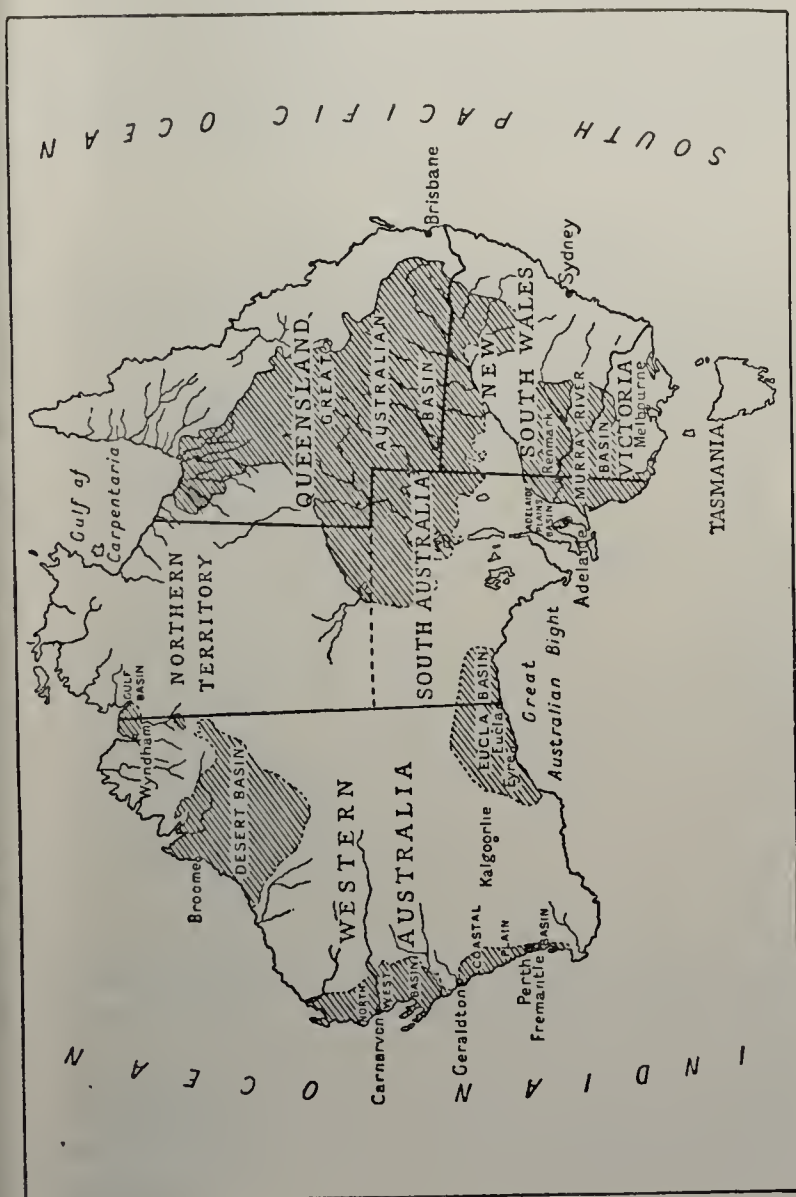


FIG. 52.—ARTESIAN BASINS IN AUSTRALIA.

From the *Australian Year Book*.

upwelling of cold ocean water, so pronounced off the western shores of South America and South Africa, hardly occurs here. In other words, currents such as the Humboldt and Benguella currents are scarcely represented off the west coast of Australia. Again, as contrasted with

TABLE X.

POSITION, TEMPERATURE RANGE AND TOTAL RAINFALL OF REPRESENTATIVE STATIONS IN AUSTRALIA.

Note.—The first three stations illustrate conditions on the east coast; Sydney, Dubbo and Wilcannia show the diminution of rainfall on passing from the coast to the plains, Dubbo being on the inner margin of the Highland, and Wilcannia on the Darling River, in the plains. Perth illustrates the Mediterranean climate of the south-west, and Coolgarlie the semi-desert conditions on the interior plateau. *See* Figs. 53, 54, 55.

Station.	Latitude.	Height above sea-level in feet.	Total rainfall in inches.	Temperature range. °F.
Cape York ..	11° S	69'	82"	5·6°
Brisbane ..	27½° S	137'	47"	19·1°
Sydney ..	34° S	146'	48"	19·3°
Dubbo ..	32° S	870'	22"	31·3°
Wilcannia ..	31½° S	267'	10"	31·4°
Perth.. ..	32° S	197'	33"	19·1°
Coolgardie ..	31° S	1389'	9"	26·5°

the two other areas, only a small part of Australia extends to the north of latitude 15° south, and there is free exposure to ocean influences in the north.

These facts, together with what has been already said in regard to relief, enable us to deduce the outstanding features of the climate of Australia (Table X). So far as temperatures are concerned a notable feature is the warmth of the west coast as compared with similar

latitudes in South America (p. 354), owing to the absence of well-marked cold ocean currents. The same cause accounts for the fact that true desert can scarcely be said to reach the coast in the west of Australia in tropical latitudes. There is a narrow area of low rainfall in the

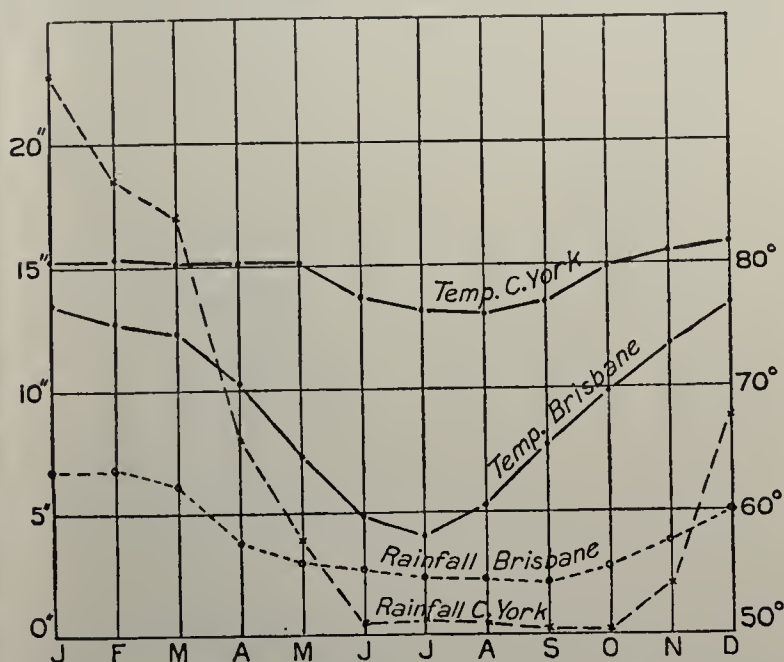


FIG. 53.—MEAN TEMPERATURE AND RAINFALL AT CAPE YORK AND BRISBANE.

region between the tropic and Sharks Bay, but this is nothing like so extensive as the Atacama desert in Chile or the corresponding desert belt of South-west Africa.

So far as rainfall is concerned, the main feature is the aridity of the interior, one-third of the continent having a precipitation of less than 10 inches per annum (Fig. 57). Regions of high rainfall occur in the northern peninsulas, especially Cape York peninsula and Arnhem Land, where

the rain is monsoonal in type, rain-bearing ocean winds blowing inwards in summer and dry land winds outwards in the cooler season. The east coast has also a heavy rainfall, the south-east trade winds depositing rain as they ascend the Highland (cf. Natal). The amount diminishes rapidly towards the interior, the 30 inches isohyet following the 2,000 feet contour in much of New South

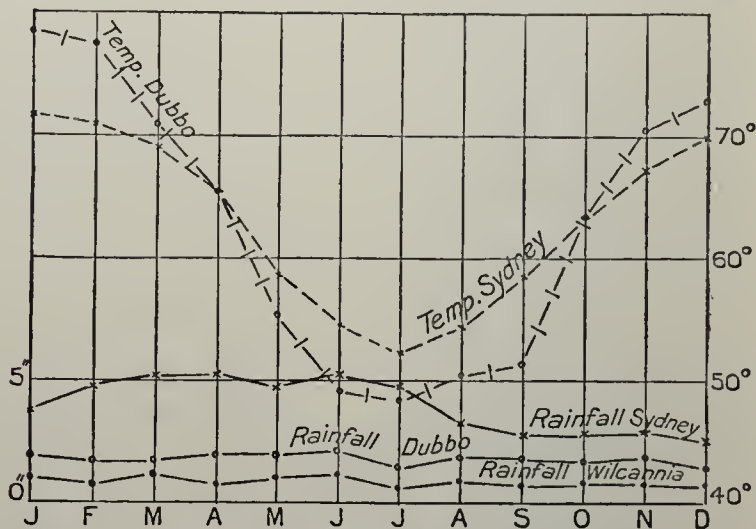


FIG. 54.—MEAN TEMPERATURE AND RAINFALL AT SYDNEY AND DUBBO, AND RAINFALL AT WILCANNIA.

Wales and Victoria, so that the rainfall tails off as the plains are approached. Not only is the total fall small there, but the variability from year to year is great.

In the northern part of the east coast (Fig. 53), though rain occurs at all seasons there is a very definite summer maximum. Further south the fall is well distributed throughout the year, but with a tendency towards a cool season maximum. In the extreme south-west of the continent, on the other hand, as one would expect from the position, the rainfall is definitely of the Mediterranean type, with a winter maximum and well-marked summer

drought. This type recurs in the Adelaide area of South Australia, also freely exposed to the westerly winds of winter. On the west coast the elevated plateau margin gives good rains to the area round Perth and Albany, but the amount tails off rapidly northward without losing its winter character. North of the tropic it begins to increase in amount and falls in the summer season, that is, becomes of the inter-tropical type.

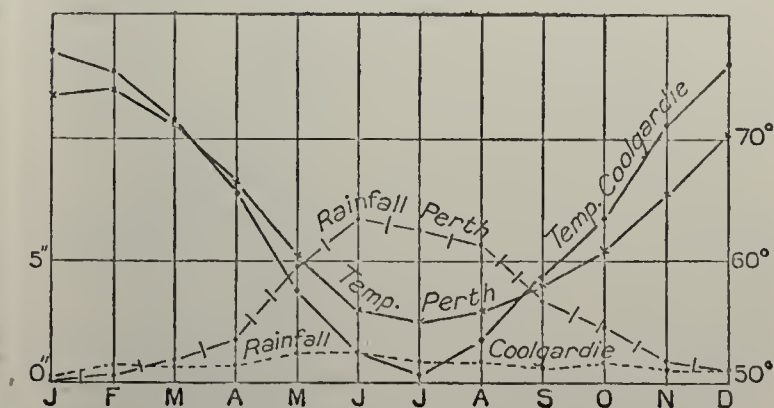


FIG. 55.—MEAN TEMPERATURE AND RAINFALL AT PERTH AND COOLGARDIE.

PLANTS AND ANIMALS. Biologically the wild life of Australia is of very great interest because it consists almost entirely of old-fashioned types, most of which are peculiar to the country, while the common plants and animals of the old world are absent. Economically, however, plants and animals are of little importance, and of all the continents Australia has yielded fewest forms of value to man. The eucalyptus trees yield oil, tanning material, and sometimes, particularly in the case of the jarrah and karri of south-western Australia, valuable hardwood timbers. Many kinds of eucalyptus have also proved valuable as means of afforesting arid areas in other parts of the world. The abundant acacias, especially the black wattle, yield much tanning material,

though the Commonwealth actually imports black wattle bark from Natal, where the plantations were originally established from Australian seed. With such minor exceptions the native plants are almost without significance, except for the grasses and shrubs such as salt-bush which supply pasture for sheep and cattle, while the animals, such as the kangaroo, are mainly destructive rather than capable of yielding large amounts of useful products like furs. Further, it is remarkable that the native plants and animals seem to have but a moderate hold on their own territory, so that introduced forms flourish at the expense of the native species to an extraordinary extent. The spread and destructiveness of the European rabbit is an obvious example, but no less remarkable, if less familiar, is the way in which many introduced plants have become deadly weeds, replacing the native pasture plants. The prickly pear, a cactus introduced from North America, is an example, but there are many others; not a few English wild plants, introduced accidentally or from sentimental motives, have spread in a fashion quite unknown in the motherland. All the cultivated plants and domesticated animals have been introduced from other parts of the world.

As regards the distribution of the plant formations, Fig. 56 shows that the continent presents a curious approximation to the condition which should exist theoretically in a large, compact and uniform land-mass. In other words there is a tendency for the vegetation types to show a concentric type, a marginal forest belt giving place to an inner ring of savannas and grasslands which passes into a central desert area. The concentric arrangement is not perfectly diagrammatic on account of the shape which, for example, permits the central arid belt to reach the sea on the coast of the Great Australian Bight, and the dry grass-steppes to reach the west coast near the tropic.

The peripheral forests fall into four main groups. Where the summer rains are very heavy and other conditions favourable luxuriant tropical forests occur, giving place on parts of the east coast and on the Highlands to a more open type. In the south-east and in

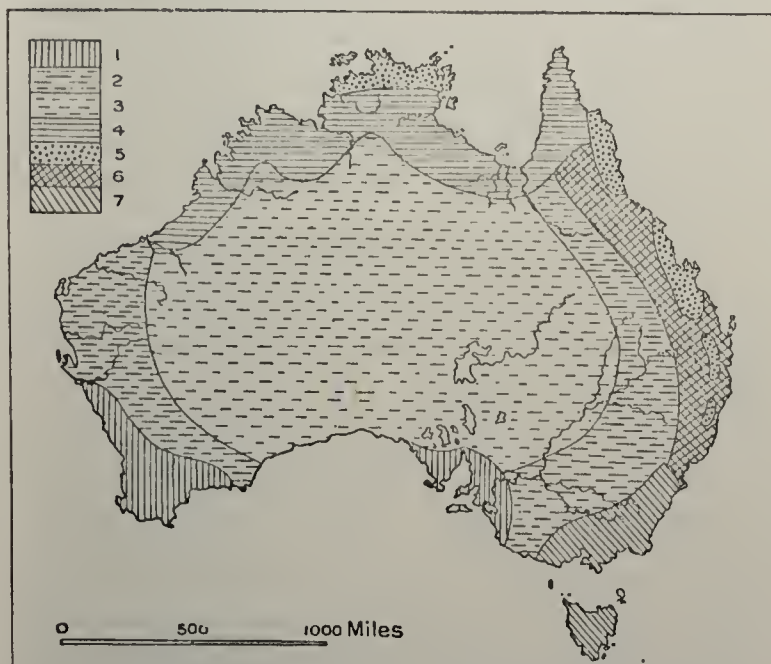


FIG. 56.—VEGETATION ZONES IN AUSTRALIA.

- 1 Scrub forest (Mediterranean type); 2. Grass-steppes; 3. Bush-steppe, semi-desert and desert; 4. Savannas; 5. Luxuriant tropical forest; 6. Open tropical and sub-tropical forest; 7. Warm temperate forest.

Tasmania, with fairly heavy and well-distributed rains, this is replaced by a warm temperate type, while the zones of Mediterranean climate have a characteristically drought-resistant type, with many kinds of eucalyptus, these being the prevailing trees everywhere, though mingled with many others. In the northern interior the forests, as total rainfall diminishes and the cool season drought becomes marked, give place to tropical savannas

with grass and scattered trees, while in the east, within the peripheral forest belt, and west, there is a strip of grass-steppes or prairies with trees along the watercourses and isolated trees elsewhere. As rainfall diminishes these savannas and grass-steppes give place to bushland, grass being less obvious than low bushes (scrub), the grasses present being often spiny (*spinifex*) and highly drought-resistant. North of the Great Australian Bight the scrub is made up of particularly thorny types of shrubs. Considerable tracts in the interior have little vegetation at all, save after the occasional rains, and areas encrusted with salt are frequent.

PEOPLE. The original inhabitants of Tasmania were a very primitive type of aborigine, now extinct. The native Australians were of a different type, though they also were purely at the collecting stage of culture. Their numbers have decreased, but about 62,000 pure breeds remain, chiefly in the remoter parts of the country. The remainder of the population is almost entirely of European stock, and mainly British. The White Australia Policy excludes Asiatics, and it is hoped to develop even the tropical parts of the country with white labour. Meanwhile the tropical parts of Australia have a small population, the population being concentrated in the eastern and south-eastern, and, to a smaller extent, the south-western parts of the continent. The dry interior is practically devoid of population. Victoria with its considerable extent of well-watered lands, Tasmania, which has a good rainfall, and New South Wales, are the most densely-peopled states. The very small density in Western Australia as a whole (39 persons per 100 square miles) reflects the fact that the population is concentrated in the south-west, in the region with good winter rains, and to a minor extent on the Coolgardie and Kalgoorlie goldfields.

PASTORAL AND AGRICULTURAL PRODUCE. In the major Australian industry, that of sheep-rearing, New

South Wales has always been the leading state, the sheep being reared on the plains. Cattle are widely distributed, being numerous in Queensland, New South Wales and Victoria, but the growing industry of dairying is mainly concentrated in New South Wales and Victoria. Wheat (Fig. 57) is most extensively grown in



FIG. 57.—THE WHEAT BELT OF AUSTRALIA.

The areas within which wheat is grown extensively are shaded, the cross-hatching corresponding to the areas of maximum production. The annual isohyets of 10 in. and 5 in. are shown.

New South Wales, Victoria and the regions of Mediterranean climate in South Australia and Western Australia. Fruit-growing is extensively carried on wherever the rainfall permits or water can be obtained for irrigation (p. 388). In South Australia and Victoria there are extensive vineyards, with a considerable production of wine. An interesting recent development is the production of raisins and currants (p. 142) on a considerable scale; for Victoria and South Australia are now

attempting to challenge the Greek virtual monopoly of the currant trade. Other fruits are widely cultivated, New South Wales being especially notable for its oranges and lemons, as Tasmania is for its apples. Great efforts are being made to establish a considerable sugar industry in Queensland based on the cultivation of sugar-cane by white labour, and Australia in recent years has had a surplus of sugar for export, while formerly she imported it from Fiji and Java. Victoria is also growing a certain amount of sugar-beet. Efforts are being made to promote cotton cultivation in Queensland, which already produces a variety of tropical and sub-tropical products.

MINERALS AND LINES OF COMMUNICATION. Settlement in Australia on any considerable scale originated in the discovery of its great mineral wealth, especially its goldfields. The minerals are still of great importance, though, as usual, the centres of production, especially of gold, are constantly tending to shift as the deposits are exhausted or become too expensive to mine. With the discovery and development of the different fields the tendency was to run railway lines from the coast to the fields. In the east, the part first settled, the Highland, as we have seen, presented great difficulties to railway construction. More serious was the fact that developments took place independently in the different states, and the lines were built on different gauges, rendering inter-state communication costly. Though a number of connecting lines have been built, especially in the south-east, the railway map of Australia still shows the curious feature of a number of lines running inward from the coast and apparently ending blindly, the motive of construction being usually the desire to tap mineral deposits. There is now a transcontinental line running from Fremantle, the port of Perth, past the goldfields of Coolgardie and Kalgoorlie to Port Augusta on Spencer's Gulf. Port Augusta is connected to the eastern system, but changes of gauge occur.

Of the minerals gold is widely distributed. Apart from the fields in West Australia just mentioned it occurs in Victoria, as at Ballarat and Bendigo, and also in New South Wales and Queensland (as at Charters Towers). The Broken Hill mining district near the western frontier of New South Wales, which finds an outlet by the railway to Port Pirie on Spencer's Gulf in South Australia, produces silver, lead and zinc. Copper is important in South Australia and New South Wales (Cobar); tin in Tasmania as well as in the eastern part of the continent. There is also an abundance of iron. Very important are the coal deposits, since good coal is infrequent in the southern hemisphere. The most extensive deposits are those round Sydney, extending from Newcastle in the north to Bulli in the south and Lithgow in the west. At Sydney the coal is deeply buried beneath other deposits, but it is mined on a large scale at Newcastle, from which it is exported. Other coalfields occur in Western Australia near Collie, to the south of Perth, and within reach of the smaller port of Bunbury; in Queensland, especially near Ipswich, to the west of the port of Brisbane; in Victoria, especially in Southern Gippsland, and to a comparatively small extent in Tasmania, as well as elsewhere.

THE POLITICAL UNITS. The Commonwealth of Australia is made up of the six original states of New South Wales, Victoria, Queensland, South Australia, Western Australia and Tasmania, with the large Northern Territory, now divided for administrative purposes into North and Central Australia, and the small Federal Capital Territory, including the capital, Canberra. Of the mainland states Victoria is the smallest, but has much the highest density of population. This may be associated with the fact that the plains lying to the south of the Highland, particularly in Gippsland, are fertile and well watered, that a considerable amount of irrigation has been carried out in the drier northern plains, and that the mineral wealth is considerable. Melbourne, the capital, has a

population just under 1 million, and includes more than half the population of the state. It is placed on the Yarra, a short distance above its entrance into Port Philip Bay, which affords safe anchorage, but is somewhat shallow. A number of railways converge on Melbourne, for not only is the Highland behind easily crossed, but a number of lines connect the southern lowlands with the capital.

New South Wales is much larger than Victoria, but has a much smaller density of population on account of the aridity of the western part. Sydney has, however, a larger population than Melbourne, including well over 1 million people. It has a splendid harbour, the value of which is increased by the fact that no river flows into it so that no silting up can occur. The vicinity of coal, (p. 399) is also important, as is the way in which railway routes from the plains, both coastal and interior, converge on the city, which serves as their outlet. The Riverina plains lying north of the Murray, which for much of its course forms the boundary with Victoria, are remarkable for their sheep-rearing and production of fine wool. Bathurst, on the plateau behind Sydney, is the centre of the wheat production of the state.

Queensland, next to Western Australia, is the largest of the mainland states, but has a total population less than that of the city of Melbourne. The capital, Brisbane, with a population of under 275,000, is the only large town. To the west of it lie the Darling Downs, famous for their fine pasture grasses; cattle are reared in the damper parts of these. Sugar-cane is grown especially along the valleys of the coastal rivers, where the soil is rich. Bundaberg, Mackay and Cairns are important centres.

South Australia contains such a large amount of arid land that its small population, only about one-third of that of Victoria, is easily understood. The population is mainly centred round the two gulfs, the region round



SUGAR COUNTRY, NORTHERN QUEENSLAND

Sugar-cane, which requires a combination of moisture and heat, is grown everywhere on lands of this type, where the natural vegetation is luxuriant.



CUTTING SUGAR-CANE IN QUEENSLAND

Queensland is the only part of the world in which cane-sugar is being produced for export by white labour only.

Photos supplied by Commonwealth Immigration Office.

St. Vincent Gulf being a rich wheat-producing area (Fig. 57). Adelaide, the capital, is rather larger than Brisbane. The Northern Territory, with under 5,000 inhabitants, is as yet undeveloped.

Western Australia is the largest but most thinly-peopled state; its original importance depended on its goldfields. Considerable agricultural developments are now taking place in the south-west, with a certain amount of live stock rearing in the north-west. In the former area much wheat is produced, and the wheat acreage is increasing rapidly. Perth, the capital, has under 200,000 inhabitants; it is connected by rail with its port, Fremantle.

The island of Tasmania, which is not greatly inferior in size to Scotland, has next to Victoria the highest density of population of the six states. It is well suited to English crops, especially English fruits. Hobart, the capital, contains about 50,000 people. Fruit-preserving, including jam-making, is important.

TRADE. The essential feature of Australian trade is the predominance of wool among the exports. The wool, mainly derived from merino sheep, is, particularly that obtained from Victoria and New South Wales, of very high quality. The sheep are, on the other hand, less fitted for meat production. After wool, wheat is the most important item in the export list, its great importance being a comparatively recent feature. Minerals, especially gold and lead, are also largely exported. In contrast to New Zealand (see below), with its damper climate, dairy produce and meat are only produced to a minor extent. Great efforts are being made to stimulate the production of butter, of fruits, and so forth, in order to increase the rural population. The demand for labour in connection with the sheep-rearing industry is small, and even wheat, on account of the labour-saving appliances used, absorbs comparatively little. The extension of dairy-farming and fruit-growing, both in

themselves and in the industries which depend upon them, would tend to lead to closer settlement.

NEW ZEALAND

The Dominion of New Zealand consists of the two large islands, called North and South, separated by Cook Strait, and the smaller Stewart Island with some smaller islands. The total area is about 104,000 square miles, with a population of 1,300,000, apart from over 60,000 Maoris. The main islands extend from latitude 34° south to 47° , a position which should be compared with that of central and part of southern Chile, to which New Zealand shows certain resemblances. This is especially marked in the chain of the Southern Alps, which extends along the west coast of South Island and is remarkable for its splendid scenery and its extensive glaciation. Mount Cook rises to a height of over 12,000 feet. The southern part of this coast shows a fiord character, recalling that of southern Chile. North Island is also mountainous, the mountains being often volcanoes, and the scenery, though of quite a different type, is again exceedingly picturesque. A remarkable feature of this island, which is broader than South Island, is the finger-like Auckland peninsula, which extends north-eastwards at a marked angle to the remainder. Near the base of this peninsula is the town of Auckland, lying on a good harbour to the eastern side of the narrowed isthmus, the western side having but a shallow harbour.

The climate of New Zealand is greatly modified by the comparatively small size of the islands and the free exposure to ocean winds. The rainfall is very heavy on the western side of South Island, but the Canterbury Plains, lying to the east and in the rain shadow, are drier, and here agriculture and stock-rearing are carried on extensively. Sheep are reared for mutton as well as for wool, and there is a good deal of dairying. Here stands the town of Christchurch, separated from Lyttelton, its port, at the

base of the volcanic Banks Peninsula, by a hill through which a tunnel runs. A railway passing by a tunnel below Arthur's Pass connects Christchurch with Hokitika on the west coast. Further north, at Greymouth and Westport, lie excellent coalfields, and New Zealand also produces a good deal of gold.

The very moderate temperatures of New Zealand make its products of the cool temperate type, despite the latitude. Thus wheat and oats are grown, and though grapes ripen in the north, there is no extensive production of fruit. Wellington, on Cook Strait, in the south of North Island, is the capital and has a good harbour. Dunedin, on the southern part of the east coast of South Island, is the port for the chief New Zealand goldfields.

The export trade of the Dominion is interesting because of the way in which it emphasises the essential contrasts between it and the much larger but far more thinly-peopled Commonwealth. Taking the year 1926 for New Zealand and the corresponding period of 1926-7 for Australia, we get the following facts. The total exports of Australian produce amounted to about 142 million pounds by value as against about 44 millions for New Zealand. In the first case wool accounted for about 42 per cent. of the total, with a value of some 60 million pounds. No other single item even approached this in amount. In the case of New Zealand wool was again the largest single item, but only amounted to 27 per cent. of the total, with a value of about 12 million pounds. In the Australian list wheat ranked second, with a value of about 21 million pounds, forming 15 per cent. of the total. Apart from gold, which formed 8 per cent. of the total, the other items in the list were relatively small, whether expressed as percentages or by value. In the case of New Zealand butter and frozen meat, each accounted for about 20 per cent. of the total exports, and the value, approximately 9 million pounds in each case, was much greater than the value of Australian exports of these

commodities. Cheese also forms a large item in the list of exports from New Zealand, while it is insignificant in the Australian list. On the other hand, New Zealand is on balance an importer rather than an exporter of wheat, and both the amount and the percentage of gold are low as compared with Australia.

In endeavouring to interpret these figures we have to note that the climate of New Zealand is so much damper than that of Australia that concentration on wool-bearing breeds of sheep is much less necessary. Cross-breeds, yielding good wool but also useful for meat production, are extensively used. Further, not only are the natural pastures richer, but English grasses thrive well when sown, and the great development of the dairying industry, with the export of butter and cheese, is directly associated with these two facts.

Though the distance between the Dominion and Commonwealth ports is considerable, Wellington being about 1,300 miles from Sydney, roughly equivalent to the distance between Southampton and Madeira, and not greatly inferior to that between Marseille and Alexandria, there is a considerable amount of trade between the two. New Zealand, for example, takes from Australia wheat and flour, fruits, both fresh, such as oranges, and dried, and some coal.

THE AUSTRALASIAN ISLANDS

The large island of New Guinea, the greatest island in the world apart from Australia, lies to the north of eastern Australia, being separated from Cape York Peninsula by Torres Strait. The eastern entrance to the Strait, it should be noted, is partially closed by the prolongation of the Great Barrier Reef, which extends for nearly 1,200 miles along the coast of Queensland, and is the most striking example of a coral reef in the world. New Guinea was formerly divided between Holland, Germany and Britain. The British part, now known as Papua, is administered by the Australian Commonwealth, which

also holds a mandate over the part formerly German. The island is mountainous, heavily forested, and still largely unknown. A certain amount of cultivation of tropical plants is carried on, the coconut plantations giving rise to an export of copra; there is also fishing for pearl-shell and trepang—a curious kind of sea-slug much prized by the Chinese—in Torres Strait.

Of the belt of islands which stretches eastward across the Pacific from New Guinea we need say little beyond noting that the islands are scientifically interesting in that some, like the larger of the Fiji Islands, are high and of volcanic origin, while others are mere coral islets and atolls, rising little above the surface of the ocean. Copra from the coconut palm is the commonest product everywhere, and pearl shell is largely produced. Fiji has fairly extensive plantations of tropical crops, including especially cane sugar. The French island of New Caledonia, lying west of Fiji, contains important deposits of nickel. Nauru, just south of the equator, administered by the Commonwealth of Australia, is remarkable for its rich deposits of phosphatic guano. Good harbours are frequent, as in the Fiji Islands and the Samoan Islands, so that many of the islands are important calling-places on journeys from Australia or New Zealand to the Panama Canal. Their importance as cable stations is also considerable, as notably in the case of Fanning Island, which, however, lies north of the equator.

Australia, with an area of nearly 3 million square miles, has a population of only some 6 millions, while New Zealand, with an area of about 104,000 square miles, has a population of about 1,400,000, that is about one-quarter of the Australian population in a twenty-eighth of the area.

See the Official Year Book of the Commonwealth of Australia, annual issues; New Zealand Official Year Book; Oxford Survey of British Empire, Vol. V, Australasia; Griffith Taylor, Australia in its Physiographic and Economic Aspects (Oxford, 4th edition, 1925); G. Taylor, Australian Meteorology (Oxford, 1920).

Among general books dealing with the regional geography of the world reference may be made to the following:—The annual issues of the

Statesman's Year Book, for all statistical matter, and many references; *The International Geography*, edited by H. R. Mill (London, 1907); Chisholm and Stamp's *Handbook of Commercial Geography*, which is constantly brought up to date; *An Intermediate Commercial Geography*. Part I, *Commodities and World Trade*. Part II, *The Economic Geography of the Leading Countries*, by L. Dudley Stamp (London, 1927 and 1928). For those who can read German an excellent book, with many diagrams, is Hettner's *Grundzüge der Länderkunde*, two volumes. Many of the structural and vegetation maps in this book are based on those which appear in Hettner's work. Stanford's *Compendium of Geography*, some of the volumes of which have been brought up to date, is also useful. But there is nothing written in the English language to compare for comprehensiveness with Reclus' *Géographie Universelle* (of which an English translation exists) or the new *Géographie Universelle*, edited by the late Vidal de la Blache and L. Gallois, which is intended to replace it and of which several volumes have already appeared, or with the numerous large German works of reference.

PART VII
GEOGRAPHICAL INTER-RELATIONS

CHAPTER XXV

SOME NOTES ON GEOGRAPHICAL INTER-RELATIONS

WE have now completed our survey of the land-masses of the world, and have accumulated much material dealing with the distribution of surface-relief, and of the phenomena, both physical and organic, which depend upon that relief. A study of distribution means essentially an attempt to answer, as precisely as possible, the question *where is it?* The geographer ought to be able to go on to answer the further question *why is it there?* In point of fact, however, geographers, even with the help of the subsidiary sciences, cannot always give a complete answer to this second and more difficult question. This is particularly true as regards many meteorological phenomena and many facts of plant distribution. For example, we do not know the whole of the answer to such questions as—Why has the Punjab winter rains? Why do the forests of British Columbia contain hardly any deciduous trees? and so on. But as a general rule we can give more or less satisfactory explanations of those facts of distribution which depend on man's activities, even if we may have to take into account facts not purely geographical. A few examples may be mentioned by way of illustration; the working out of these and similar cases is a useful way of revising one's knowledge of world geography.

SITES OF TOWNS. This is a subject of great interest, and in certain aspects is quite simple. Large towns, especially historic towns, have as a rule certain local advantages of site (such as possibilities of defence, water

supply, with sometimes water-power, firm ground for building, local building material, and so forth) and of situation. The latter tends to make them converging points of routes leading through productive areas. Such historic towns almost always stand alone, for by hypothesis no other site in the immediate vicinity has the same combination of advantages. Their position can thus be explained broadly in terms of the immediate and more remote surface relief. But certain distinctively modern towns, found particularly in highly industrialised countries such as Great Britain and Germany, show remarkable contrasts. There is no obvious advantage either of site or of situation; the town is not a sharply defined unit, but is often a complex, settlements originally separate fusing together by the spread of buildings. Such town complexes have not arisen as a response to surface relief, but depend on underground wealth, especially coal, which is often deep-seated and exerts no influence on land-forms. Such towns, in other words, have arisen in response to geological, not geographical, causes.

With this condition, again, is contrasted the special case of the twin-town, of which examples are numerous (Budapest, Newcastle-Gateshead, Ottawa-Hull, etc.). These are not complexes in the same sense as the pottery towns of England or the Barmen-Elberfeld complex in the Ruhr region in Germany, for the river represents a definite zone of separation between the two units. The fusion of the two, each of which has some natural advantages of position, is due to the modern engineer's power of overcoming the obstacle presented by the barrier which determined the original duplication of the settlement.

A navigable river tends to have a town at the lowest convenient bridging-point, which is usually at or near tidal limit, and thus marks the limit of navigation, that is the area where one form of locomotion must be exchanged for another. Such towns stand at the junction of at least two routes, one along the river line, and the other

the cross-river traffic indicated by the presence of the bridge. If tributaries join the main stream at or near the bridging-point, or wind-gaps occur in encircling hills, many routes instead of only two may converge and increase the importance of the town (cf. London).

Of the shift of the centre of gravity from bridge-town ports to sites lower down the river or estuary, or to an adjacent estuary, there are many examples (e.g. Chester and Liverpool, Gloucester and Bristol). But it should be noted that before such a shift can take place it is essential that a convenient site should be available, and that the downstream port should have ready access to the hinterland which is tapped by the local traffic. Liverpool is an estuarine port, Glasgow a bridge-port, the attempts to develop Greenock in the latter case being handicapped by an awkward, because hilly, site and a situation unsuited to form a converging point of routes (note the railways in the two cases). Similar causes limit the growth of many outports, and account for the persistence of large ports at a considerable distance from the sea (cf. Antwerp and Bordeaux). The development of Montreal at the expense of Quebec (p. 305) is an example of an upstream shift, mainly due to the former town's greater command of routes from a rich hinterland. Bombay is a curious example of a shift on a much more extensive scale. Its historic predecessors were successively Broach, near the mouth of the Narbada, and Surat, near the mouth of the Tapti, both poor ports, but with greater possibilities of access to the interior. Not till the obstacle of the Western Ghats (p. 177) had been overcome by the railway engineer did Bombay definitely take the lead.

In regard to inland towns it may be sufficient to say that, apart from the coalfield towns already mentioned, the factors nearly always include the convergence of routes draining productive but diverse areas. Thus the junction of an important tributary with a main stream,

the convergence of several tributaries, a sharp bend on the course of a stream, all form favourable sites for the rise of towns where the other condition is fulfilled. It is interesting to note the position of the large towns along the course of the Mississippi and its feeders, and to compare its northern counterpart, the Mackenzie. In the latter case settlements tend to occupy similar sites, but the low productivity of the region drained prevents these attaining any size or importance.

LARGE-SCALE PRODUCTION OF FOOD AND RAW MATERIAL. A number of interesting points arise in connection with this, the reasons for the predominance of a particular area in the world export trade being often complex. Thus the United States is the largest world-producer of maize, tobacco and cotton, and the largest exporter of the two latter but not of the first, the maize of the United States reaching the world market largely in the form of meat products (p. 331). The large production of maize and tobacco might be thought to be associated with the fact that both crops were cultivated by the native population before the advent of Europeans. But cotton was grown in the Old World long before the Christian era, and yet the production in the United States far exceeds that of any other area. Apart from the reasons given on p. 332, it should be noted that vast tracts of virgin land were available, which could be put down to new crops without displacing old ones. Conversely, China tea has been largely displaced in the world market by plantation tea from Ceylon and India, because space for expansion was not available in the first country without a complete overthrow of the ancient system of agriculture, practically all available land being occupied.

On the other hand, despite strenuous efforts, the predominance of China and Japan in the raw silk market of the world has hardly been challenged. The difficulty in this case is not the growing of the mulberry tree, but the

obtaining of the necessary skilled and patient labour for the rearing of the silkworms at the right season.

As regards products which can be obtained from wild plants or animals, it is possible to say generally that when the demand becomes large and constant, the area of production tends to shift from the region to which the form concerned is native to another non-adjacent area where cultivation or domestication is possible. The shifting is in this case the important point; for it is less remarkable that natural resources should be easily exhausted than that attempts to replace them should so rarely be made in the producing area. Rubber production, which has moved from inter-tropical South America to Asia; cinchona for quinine from Colombia to India, etc. (p. 378); wattle bark for tanning from Australia to Natal (p. 394); fur production from the Canadian sub-Arctic forest to the fox farms of Prince Edward Island (p. 304), may be given as examples. Among the factors explaining the movement one is that areas yielding wild produce on a considerable scale are necessarily thinly-peopled and undeveloped, with little surplus capital and often poor lines of communication. The opportunities for starting a new industry, such as is involved in laying out plantations devoted to a new crop, are necessarily small.

LOCALISATION OF INDUSTRIES. This is one of the geographical topics in regard to which generalisation is much less easy than it seems. Among the causes usually assigned—and often learnt by heart by unintelligent pupils—the following are among the most important: access to power, both mechanical (coal, etc.) and manpower, that is labour; access to raw material; access to markets. In the case of particular industries special factors may be important; for example a damp atmosphere facilitates cotton-weaving, as the fibres are less liable to snap than in a dry one; soft water for washing raw wool is important in connection with the woollen industry; water containing gypsum and therefore hard is important

for the brewing of some kinds of beer. Considered as general statements these are sound enough, but it is often dangerous to argue from the presence of a particular industry that such advantages must necessarily be present. The textile industries of Lodz in Poland (p. 95) are a case in point. The textiles manufactured include cottons, linens, woollens and jute goods, but there is no coal very near, and before recent improvements in lines of communication access to raw material was not easy. The reason for the localisation is, indeed, not to be sought in the usual "factors," but in the fiat of the Russian autocracy, the ruling powers desiring that the Russian market should be so far as possible supplied by factories placed within the imperial boundaries. The factories were established in the early part of the 19th century.

Apart from such cases of artificial fostering there are many others where the causes of localisation are too complex to be embraced by a simple formula. The iron industry is a case in point. It is generally true that iron ore moves to coal, because a very large amount of the bulky fuel is required for smelting (examples occur in Great Britain; in Germany, as on the Ruhr coalfield; in U.S.A., as at Pittsburg). But the process may be reversed. Duluth (p. 328) has an iron industry, although it is remote from coal, because coal goes out cheaply in ships which return with cargoes of wheat or iron ore. A somewhat analogous case was furnished by the industries of North Italy before the war, for coal could be carried to Italy cheaply by boats which brought back wheat from the Black Sea ports. Thus in a sense—though other factors are also at work—the great development of hydro-electric power in Italy since the war may be associated with the virtual disappearance of the Russian export trade in wheat. In the United States the iron industry of Buffalo and Cleveland (p. 328) depends on more complicated causes. Both towns, though relatively remote alike from coal and iron, can, as it were, tap streams of both

commodities flowing past them ; for Lake Superior ore is carried past them on its way east, and Pennsylvanian coal on its way west by the Great Lakes or northwards into Canada (p. 329).

Examples of such complexities might be multiplied. It is sufficient to repeat what has been already suggested in the Introduction, that the great advantage of a world survey, even a summary survey, is that it enables one to realise how closely, under modern conditions, the various parts of the world are linked together, so that any selective study of particular areas must leave one with many cut threads.

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QUESTIONS

PART I—EUROPE

1. Describe the main features of the structure of Europe, pointing out the chief contrasts between Eastern and Western Europe.

2. What is a Natural Region? Divide Europe into Major Natural Regions, stating the basis of your division.

3. In what Climatic Region of Europe can each of the following stations be placed? Give your reasons fully.

(a) Temperature range, $15^{\circ} 5$; annual rainfall, 56 inches, most rain in winter, least in spring, but no season with less than 20 per cent. of total.

(b) Temperature range, 26° ; annual rainfall, 30 inches, most rain in winter (39 per cent.), least in summer (5 per cent.).

(c) Temperature range, 46° ; annual rainfall, 21 inches; most rain in summer (37 per cent.), least in winter (17 per cent.).

4. The olive will only thrive where the summers are dry, where the average temperature in late spring or early summer reaches 66° , where there is no continuous severe frost in winter. Maize requires a good deal of moisture during the growing season, with average temperatures not below 66° . In what parts of Europe would you expect the two plants to grow and why? Could they be grown in the same type of climate? (Note that maize is an annual plant, remaining in the ground, in different parts of its range and with different varieties, from a minimum of three months to a maximum of about six months.)

5. Compare and contrast the climates of Central Russia, South-western Ireland and Southern Italy, with particular reference to amount and distribution of rainfall.

6. Divide France into Natural Regions and describe briefly the regions recognised.

7. Describe, with a sketch-map, the position of Paris, and give reasons for its predominance among the cities of France.

8. A line from Havre to Cette divides France into two parts, of which the eastern is more industrialised than the western. Prove this statement and give reasons for the differences between the two sections.

9. State the exact position of the towns of Lyon, Marseille, Dijon and Bordeaux, and account for their importance.

10. Describe generally a journey from Paris to Turin by the Mont Cenis tunnel, noting the natural regions passed through and their products.

11. Discuss the distribution of the following crops in France—the vine for wine-making, sugar beet, wheat, early flowers and vegetables. Account for the importance of the wine-making industry in France.

12. Outline the main features of the structure of England and Wales, and give a more detailed account of the English Plain.

13. On what kind of evidence is the statement that the British Isles are but a separated part of Continental Europe based?

14. Describe in some detail the South Wales coalfield, indicating the chief industries carried on and naming the more important towns. Compare it briefly with the Northumberland and Durham field.

15. Give an account of the following pairs of ports, noting the contrasts between the members of each pair in position and kinds of traffic carried on:—Liverpool and Birkenhead; Portsmouth and Southampton; Gloucester and Bristol; Glasgow and Greenock; Hull and Grimsby.

16. Compare the Highlands of Scotland with Norway as to relief, resources and the occupations of the inhabitants.

17. Give a concise account of the course of the Rhine from Basel to the sea and estimate its importance as a highway. Add a special note on the Ruhr area.

18. How can the high density of population in Belgium be accounted for?

19. Give a concise account of the geography of Holland, indicating the chief resources. Add notes on the towns of Rotterdam and Amsterdam.

20. State the precise position of the town of Berlin and account for its exceedingly rapid growth since the middle of the 19th century.

21. What are the main contrasts—as regards structure, relief, products and occupations of the inhabitants—between Norway and Sweden?

22. Name the chief Danish ports and account for the great pre-dominance of Copenhagen.

23. Give a careful account, illustrated by a sketch-map, of Upper Silesia, explaining the reasons for its importance.

24. Give a concise account of Czechoslovakia, naming some of the chief towns and indicating their position and the reasons for their importance.

25. Write notes on the following towns, indicating their position

and the reasons for their importance—Basel, Constantinople, Salonika, Bucharest, Zurich.

26. Describe the distribution of the main vegetation types in European Russia, indicating the limits of each type and pointing out the characteristic products and occupations in each zone.

27. Write notes on the position and importance of Leningrad, Moscow, Kiev, Odessa and Archangel, and compare the value of Leningrad and of Moscow as capital cities.

28. Name some of the chief Baltic ports, and discuss the nature of Baltic trade, comparing it with that carried on over the Black Sea.

29. Name some of the characteristic crops of the Mediterranean region, distinguishing between those which do or do not require artificial watering, and discussing the distribution of the crops named throughout the region and the reasons for this.

30. Compare Spain and Italy as to relief, climate, natural resources and products.

31. It has been said that "Europe ends at the Pyrenees, where Africa begins." How far do you think this is true and why? Compare the relations of Spain and of Italy to the lands of Central Europe.

32. What kinds of commodities are likely to be carried on ships coming to Great Britain from (a) the Biscayan ports of Spain, (b) from Italian ports, (c) from Black Sea ports, (d) from Baltic ports? Give reasons in each case and suggest possible return cargoes.

PART II—ASIA

33. Indicate the main features of the relief of Asia, and show in what ways the relief favoured the eastward expansion of Imperial Russia.

34. How can the concentration of population in the eastern and south-eastern parts of Asia be accounted for?

35. Make a careful comparison of the climates of Bombay and Peking, showing why, despite the great differences, both can be described as monsoonal.

36. Compare, from the point of view of crop production, the relative value of the monsoonal and Mediterranean types of climate.

37. Describe the main features of the structure and relief of India, and account for the great density of population in the Indo-Gangetic Plains.

38. Write notes on the following, indicating the points of special

interest :—The Khyber Pass, the Thar Desert, the Tarim Basin, the Palghat Gap, the Western Ghats.

39. What crops are particularly associated with the following areas in India :—Assam, the Punjab, the Deccan, the Lower Ganges Valley ? Show how the areas are fitted to the particular crops grown.

40. What parts of India are specially liable to famine and why ? How is it that Indian famines are now much less serious than they used to be ?

41. Describe the distribution of rain throughout the year and throughout the country in India and discuss its relation to crop production.

42. Account for the concentration of the sea-borne trade of India on a small number of ports. Name the chief ports, and give a reasoned account of the trade of each.

43. Into what Major Natural Regions can China be divided and what are the main characteristics of each ?

44. Discuss the value of the Yangtze as a waterway, and indicate the main products of the lands through which it passes. Add a note on the Red Basin.

45. Account for the very dense population of Japan, and discuss the occupations of the inhabitants.

46. To what main causes does the Malay peninsula owe its great economic importance ? Add a note on the port of Singapore.

47. Discuss the distribution within Asia of the following products, indicating for each area named whether the product mentioned is mainly consumed at home or is exported—silk, tea, quinine, rubber, cane sugar, rice, cotton, Manila hemp.

48. Java has a very high density of population, Borneo a low one. How can the difference be explained ?

49. Name the great rivers of Siberia, and point out their advantages and disadvantages as waterways.

50. Give an account of the Trans-Siberian railway and its Manchurian connections, and discuss its importance.

51. Give some account of Tibet, showing the effect of the altitude upon the life of man.

52. What is meant by an *entrepôt* ? Illustrate by a careful account of the port of Aden.

53. What structural resemblance is there between Irak and the Indo-Gangetic plains ? Point out some of the outstanding differences between the two areas from the standpoint of human life.

54. In what parts of Asia are the following domesticated animals respectively used, whether for transport and similar purposes or for their products :—Yak, elephant, camel, horse, water buffalo, humped cattle ? Give reasons in each case.

PART III—AFRICA

55. Give an account of the Rift Valley of East Africa, noting its effect on drainage conditions.

56. How far is it true to say that the climatic regions of Africa are repeated on either side of the equator ?

57. Give a careful account of the equatorial type of climate, with particular reference to rainfall, and point out the main contrasts with the tropical type.

58. Summarise the main points in regard to the distribution of vegetation types in Africa.

59. What combination of causes help to account for the long delay in the exploration of the interior of Africa ?

60. Discuss the distribution of types of men in Africa, naming the races represented.

61. Compare the Anglo-Egyptian and the French Sudan as to outlets and possibilities of irrigation.

62. Discuss the cause and nature of the Nile floods.

63. Distinguish between perennial and basin irrigation in Egypt, indicating the advantages and disadvantages of each.

64. Name the chief crops of Egypt, distinguishing between cool and warm season crops, and between those grown for home use and for export.

65. Give a concise account of Nigeria, indicating the chief resources.

66. Discuss the distribution of the following crops in Africa :—Cocoa, cotton, sisal hemp, coffee.

67. To what extent is it still true that exports from equatorial Africa are mainly natural products and not the result of human effort ? Mention some of the chief exports.

68. How can the close economic relations between (a) Liverpool and British West Africa and (b) Marseille and French West Africa be explained ? Mention some of the ports in each case and indicate the kind of traffic carried on.

69. Describe the relief and climate of Africa south of the Zambezi-Cunene line.

70. Name some of the chief ports on the east coast of Africa and indicate the areas to which they serve as natural outlets.

71. Give a concise account of the mineral resources of South Africa.

PART IV—NORTH AMERICA

72. Name and describe shortly the main structural elements in North America, with special reference to the Canadian Shield and the Interior Plains

73. Give an account of the St. Lawrence-Great Lakes waterway, naming the chief canals associated with it.

74. What is meant by "cold waves" and "hot waves" in North America and what is their importance?

75. Discuss the distribution of forests in North America, distinguishing between the main types of forest.

76. Give an account, illustrated by a sketch-map, of the Hudson-Mohawk region, showing its importance in connection with lines of communication.

77. Discuss the resources of the Canadian Shield and the developments which are going on within this area.

78. Discuss the distribution of coal in Canada, and explain how it is that the country both imports coal from the United States and exports coal to it.

79. Describe the routes by which at the present time wheat from the prairie provinces of Canada may reach the sea-boards, and indicate the chief schemes for the improvement of the existing routes.

80. Describe one transeontinental route across Canada, indicating the types of country passed through, and naming some important towns on the route.

81. Compare the position and traffic of Montreal and Vancouver.

82. Describe the Atlantic Coastal area of the United States, indicating the position of the more important early colonies.

83. What is the Fall Line? Name some of the important towns which stand on the line and indicate their importance.

84. Write notes on the following:—The Erie Canal, the Great Appalachian Valley, Fort Duquesne (Pittsburg).

85. Discuss the causes which led to the rapid growth of the city of Chicago.

86. Give some account of the industries of New England.

87. Name the chief coalfields of the United States, and account for the great development of the iron and steel industry in the United States.

88. Describe the distribution of the wheat belt in the United States and in Canada. In which country is autumn-sown wheat grown extensively and why?

89. Discuss the distribution of cotton-growing in the United States, naming and defining the areas of maximum production.

90. Compare California and Florida as to climate and as to suitability for the production of the more delicate fruits.

91. Give a descriptive account of the Great Pacific Valley, stating the chief crops in its different parts.

92. What are the main resources of Mexico?

93. Discuss the composition of the population in Mexico and the United States respectively and explain the differences.

94. Give a short account of the island of Cuba, pointing out for which of its products there is a great demand in the United States.

PART V—SOUTH AMERICA

95. Compare North and South America as to position and main structural features.

96. Describe, with special reference to rainfall, the climatic types which prevail on the west coast of South America, distinguishing the separate regions.

97. Name the ten independent republics of South America and give brief notes on their position and resources.

98. Discuss the composition of the population in South America, with special reference to the distribution of the Spanish, Portuguese, pure-bred Indian and negro elements.

99. Divide the Argentine into natural regions and name the characteristic products of each region.

100. Give a reasoned account of the distribution of wheat, maize and sheep-rearing in the Argentine.

101. Account for the concentration of population in the eastern part of Brazil, and discuss the characteristic products of the different parts of the eastern coastal belt.

102. Write notes on quebracho, maté, Chilean nitrate.

103. Describe the position and indicate the reasons for the importance of the following ports:—Valparaiso, Rio de Janeiro, Manaos, Iquique, Bahia Blanca.

104. Give a concise account of Chile, indicating the natural regions into which it can be divided.

PART VI—AUSTRALASIA

105. Account for the concentration of the population of Australia in the east and south-east of the country.

106. Compare the climatic conditions on the west coast of Australia with those in corresponding latitudes on the west coast of South America.

107. In what parts of the Australian Commonwealth are fruit-production and wheat-growing carried on on a considerable scale, and what are the favouring causes?

108. Give some account of the mineral resources of Australia.

109. Write notes on the following towns:—Sydney, Melbourne, Perth, Adelaide.

110. Compare the exports of New Zealand with those of Australia and account for the differences.

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